"Protecting Public Health and the Environment"

Passaic Valley Sewerage Commission

Standby Power Generation Facility Project

Program Interest ID No. 07329 BOP 190004

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INTRODUCTION

The Passaic Valley Sewerage Commission (PVSC) is in the process of completing a $600 million resiliency project at its main facility in Newark, New Jersey. The project is being completed under the auspices of the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Program. Project development started in November 2012, in the immediate aftermath of Hurricane Sandy. Sandy devastated PVSC and its facilities, causing a complete shutdown of all operations which, in turn, resulted in significant, immediate threats to public health, safety, and the environment. It was only through a massive, coordinated effort between PVSC, FEMA, the United States Environmental Protection Agency (USEPA), the United States Army Corps of Engineers (USACE), the New Jersey Governor's Office, and the New Jersey Department of Environmental Protection (NJDEP) that PVSC was able to be restored to functionality. The extent of the damage was so great that Sandy-related repairs and issues continue to this day.

Sandy exposed three major resiliency weaknesses at PVSC's main facility: (1) the lack of protection from storm surges; (2) the susceptibility of the substantial underground portions of PVSC to flooding, regardless of the cause of the flooding; and (3) the lack of reliable backup electrical power in the event of a transmission grid failure. Due to the breadth of its operations and the number of New Jersey residents who depend on those operations on a day-to-day basis, PVSC is the most important single piece of public health infrastructure in the State of New Jersey. Accordingly, PVSC was directed to address the three issues identified above. The resiliency project does so through the construction of four interrelated components: installation of over 14,000 linear feet of flood walls, reconfiguration of facility drainage systems, installation of flood water pumps, and installation of an emergency use on-site standby power generating facility.

By correspondence dated January 24, 2022, NJDEP has requested that PVSC provide this statement regarding the standby power generating facility (SPGF) portion of the project. The statement provides the historical context leading to the development of the SPGF, the original design specifications, alternative solutions that were considered, the environmental impact of the original design to the surrounding community, and the extensive public outreach that has taken place.

Importantly, the statement also chronicles steps taken with regard to the SPGF project in response to stakeholder concerns and opinions, and steps PVSC intends to take in the future. These steps include:

1. Inclusion of state-of-the-art air emissions controls for the SPGF that go beyond NJDEP air emissions requirements.

2. Limitation of the SPGF to emergency use and regular maintenance operation only. During a year in which no emergency operation takes place, the SPGF will be offline for 353 days, operating for 12 days maximum, if not less.

3. In connection with No. 2 above, withdrawing an initial request for peak shaving runtime. PVSC had anticipated running the SPGF for purposes of peak shaving. Peak shaving would have involved operation of the SPGF during periods of high stress/demand on the Public Service Electric and Gas (PSE&G) transmission grid, thus providing additional stability to the grid during those times for residential and other consumers. Removing this requested use eliminated over 700 hours of estimated runtime.

4. PVSC has applied to the State's Transition Renewable Energy Certificate (TREC) Program for the installation of 18 megawatts (MW) of solar power. An initial feasibility analysis for solar power generation identified a maximum of eight MW of power based on available space. However, in developing the TREC application, PVSC requested the maximum conceptual amount. PVSC plans to install all of the technically feasible solar power onsite and will also explore adjacent, remote and grid-purchased solar power as viable resources. Solar power does not provide resilient power as would the SPGF, but it would reduce the overall environmental impact of operating the PVSC facility.

5. PVSC anticipates using such power to charge batteries for use in connection with the SPGF black start generators and fire pump engines. PVSC also anticipates using the solar power to develop green renewable fuels for use in the SPGF and in PVSC's day-to-day operations.

6. Incorporation of hybrid microgrid concept. PVSC proposes to complete the SPGF as part of a hybrid microgrid to meet FEMA/NJDEP resiliency requirements while maintaining uninterrupted, sustained operations of the wastewater treatment plant (WWTP) during emergency events.

7. Conversion of combustion gas turbine generators (CTGs) to use of Green Advanced Renewable Fuels as soon as practicable. Based on discussions with the manufacturer, PVSC anticipates full conversion by 2030.

8. Complete design and begin construction of Oxygen Production Facility upgrades to include elimination of the existing boilers. This will reduce overall energy consumption and decrease air emissions from the WWTP.

9. Installation of five MW/10 MWh modular batteries. PVSC would use this capability to provide a limited amount of backup power as well as for other applications, such as improving power quality to the facility.

All of these actions will work in conjunction with each other to ensure the ability of PVSC to continue uninterrupted service in the event of a loss of power, regardless of whether the loss of power occurs from natural or manmade sources. Beyond the continuation of sewer service for more than 1.5 million people throughout PVSC's entire treatment district, the project protects those residents nearest to PVSC from more immediate dangers of flooding. Computer models show that should PVSC lose power again during a heavy wet weather event, significant portions of the

Ironbound neighborhood of Newark will experience street-level flooding. Untreated sewage in floodwaters would expose Ironbound residents to chemicals and to pathogens that cause diseases such as cholera, hepatitis, salmonella, dysentery, meningitis, and gastrointestinal disease. Dwellings affected by such floodwater would not be available for occupancy until rehabilitated, forcing residents to relocate until rehabilitation is completed.

Equally important, PVSC will substantially reduce the overall emissions coming from PVSC's operations, including those from the SPGF. The SPGF will meet the State's 2030 targets with respect to greenhouse gas (GHG) emissions and meet the objectives of the State's 2050 Energy Master Plan (EMP). Finally, completion of the SPGF coupled with PVSC's Energy Sustainability Roadmap will demonstrably improve the air quality in the surrounding community, satisfying the New Jersey Environmental Justice Law.

I. PVSC STANDBY POWER GENERATING FACILITY PROJECT GENESIS

A. PVSC in Brief

PVSC operates a secondary wastewater treatment plant located in the Ironbound section of Newark, New Jersey. Created as a gubernatorial commission in 1897 and made permanent by an act of the New Jersey Legislature in 1902, PVSC's current treatment district includes all or parts of 48 municipalities located in five counties in northeastern New Jersey. PVSC is the fifth-largest publicly owned WWTP in the United States and treats sewer and wastewater sludge from 3.43 million residents and thousands of businesses in New Jersey and New York. Situated along Newark Bay, PVSC provides daily treatment and biosolids management for approximately 25% of all wastewater generated in New Jersey, the most densely populated state in the country. PVSC also provides significant wastewater treatment services through its Liquid Waste Acceptance (LWA) Program to customers up and down the East Coast via truck or marine vessel. One of those customers is the City of New York, for which PVSC provides biosolids management for approximately 15% of the biosolids produced in New York, one of the most densely populated cities in the country. Due to the magnitude of its operations, PVSC is the largest single-site user of electricity in New Jersey. The replacement value of PVSC's treatment facility is estimated at $2.8 billion.

B. Hurricane Sandy

On October 29, 2012, Hurricane Sandy made landfall and devastated the coast of New Jersey, causing a storm surge off the Atlantic Ocean that coincided with a lunar high tide. Per the United States National Hurricane Center:

> Sandy was a classic late-season hurricane in the southwestern Caribbean Sea. The cyclone made landfall as a category 1 hurricane (on the Saffir-Simpson Hurricane Wind Scale) in Jamaica, and as a 100-kt category 3 hurricane in eastern Cuba before quickly weakening to a category 1 hurricane while moving through the central and northwestern Bahamas. Sandy underwent a complex evolution and grew considerably in size while over the Bahamas, and continued to grow despite weakening into a tropical storm north of those islands. The system re-strengthened into a hurricane while it moved northeastward, parallel to the coast of the southeastern United States, and reached a secondary peak intensity of 85 kt while it turned northwestward toward the Mid-Atlantic States. Sandy weakened somewhat and then made landfall as a post-tropical cyclone near Brigantine, New Jersey with 70-kt maximum sustained winds. Because of its tremendous size, however, Sandy drove a catastrophic storm surge into the New Jersey and New York coastlines. Preliminary U.S. damage estimates are near $50 billion, making Sandy the second-costliest cyclone to hit the United States since 1901. There were at least 147 direct deaths recorded across the Atlantic basin due to Sandy, with 72 of these fatalities occurring in the mid-Atlantic and northeastern United States. This is the greatest

number of U.S. direct fatalities related to a tropical cyclone outside of the southern states since Hurricane Agnes in 1972.

PVSC was not spared from Hurricane Sandy's wrath. Water levels started to rise in the late afternoon to early evening hours in Newark Bay and by 6:30 pm had risen to within one foot of PVSC's Sludge Storage facility located next to PVSC's dock facilities along the Bay. In accordance with established emergency planning procedures, PVSC commenced a phased retreat from Newark Bay inland, de-powering and evacuating process buildings to protect treatment equipment and personnel. At approximately 7:15 pm, PVSC's measured influent flow rate was 398 million gallons per day, almost twice the volume of what PVSC treats on a day-to-day basis during dry weather conditions.

By 8:30 pm, the phased retreat and shutdown had become futile as the storm surge had flanked and then completely encircled the entire WWTP in a classic pincer movement, flooding PVSC from all sides. Millions of gallons of seawater mixed with raw sewage proceeded to inundate the lower levels of process buildings and PVSC's massive underground tunnel system. Despite the extraordinary dedication and effort of PVSC's staff to continue to provide critical public health service to its treatment district during an already cataclysmic natural disaster, it became apparent that PVSC would lose control of operations due to the storm surge. At approximately 8:50 pm, in a last-ditch effort to save the facility, PVSC staff attempted to shut control gates to two of its three main sewer influent sewer lines (interceptors) to the plant, the Main Line and Southside Interceptor Gates, in order to prevent sewage from overwhelming the headend of the WWTP. However, the floodwaters surrounding the headend facility precluded the ability to shut the gates and raw sewage continued to flow into the headend and mix with the floodwaters.

At approximately 9:00 pm, PVSC suffered a death blow when both the primary and backup direct electrical utility feeds from PSE&G failed. As previously noted, PVSC is the largest single-site consumer of electricity in New Jersey, every day using the same amount of power needed to support the entire city of Clifton, which has a population of over 84,000 people occupying approximately 34,000 residences and businesses. Without electrical power, PVSC had no way to process wastewater flows or pump out the surging floodwater. Accordingly, facing life-threatening conditions growing worse by the second and with no other options available, PVSC staff was forced to scramble in retreat to higher ground in order to ride out the storm at a safe location.

Hurricane Sandy proceeded to absolutely devastate PVSC. While the damage caused to above-ground buildings, equipment, vehicles, and inventory was severe, the damage to PVSC's lower levels and everything contained therein was utterly catastrophic. Power cabling, process equipment, dewatering pumps, maintenance equipment, mechanical equipment, process transmission piping, electrical equipment, control equipment, inventory and contents were struck such a devastating blow in the lower levels that much of the equipment contained therein was a total loss and many items continued to fail well after the storm and its floodwaters had receded. No part of PVSC was left untouched.

The debilitating effects delivered to PVSC by Hurricane Sandy cascaded throughout the PVSC Treatment District from the WWTP itself to the collection system and finally to residences and businesses, causing imminent threats to the environment, the public health of the communities

serviced by PVSC, and the health and safety of PVSC's staff. Once power was lost and PVSC had no way to get sewage flow through the WWTP, strategic combined sewer overflows (CSOs) were automatically activated, which diverted the raw sewage coming from PVSC's Main and Southside Interceptors into the Passaic River. (Sewage flows from Hudson County continued to be pumped into the PVSC plant via a force main, further adding to the flooding until 10:30 am on October 31st, at which time PVSC was able to bypass the plant by diverting the raw sewage coming from Hudson County into Newark Bay in order to prevent further flooding in the plant.)

Operation of the strategic CSOs allowed enough raw sewage to escape from the lines to prevent equipment damages or pressure discharges into the Ironbound and other local areas where public health would be an overriding concern. PVSC was also finally able to manually close the gates to the Southside and Main Interceptor sewer lines as flood waters started to recede. However, due to the level of devastation to the WWTP and the unexpected duration of power being out, PVSC was unable to alleviate enough pressure, and PVSC started to receive reports of sewage backing up into area residences.

It was, thus, that PVSC found itself in an untenable situation and with precious little time to resolve the severe, complex dilemmas posed by Hurricane Sandy. The available options were:

1. Open the two closed plant influent gates and continue to flood the entire WWTP, creating a long-term environmental and public health catastrophe since the WWTP would never be able to be repaired under the conditions then present, leaving one out of every six New Jersey residents without sewage treatment service for the foreseeable future;

2. Create/continue to allow an immediate public health catastrophe by allowing sewage to continue to back up into residences and businesses until the WWTP was able to take the sewage again, likely displacing tens of thousands of residents in the midst of a 500-year catastrophic natural disaster and causing severe property damage that would likely leave structures uninhabitable until completely rehabilitated; or

3. Open up more CSO points and add to the developing environmental catastrophe but avoid causing an immediate public health catastrophe.

In consultation with the Governor's Office, NJDEP, the New Jersey State Office of Emergency Management, and FEMA, and in order to protect public health and safety, the decision was made to open additional CSO points in order to relieve flows to the WWTP. From 9:00 pm on October 29 to 8:45 am on November 3, it is estimated that approximately 840 million gallons of raw sewage were bypassed into the Passaic River and Newark Bay.

C. Hurricane Sandy Recovery – First Steps

The inability of PVSC to treat sewage from its 48 municipalities posed obvious, imminent public health and environmental threats. What had been less obvious – but almost immediately became apparent – was the critical role that PVSC also plays in the provision of drinking water to the region. The first step in the treatment of drinking water in order to make it safe for consumption is to settle out particulate matter found in the source water. This is commonly achieved by placing the source water in settling tanks and adding aluminum sulfate or other similar substances to bind to the particulate matter, causing it to sink and form a sludge that settles on the bottoms of the settling tanks. The clarified source water then continues to flow through the water treatment plant for further processing before use. The sludge is then removed from the settling tanks and sent to a wastewater treatment facility for disposal.

PVSC serves as the primary disposal site for alum sludge generated by several regional drinking water treatment facilities. With PVSC being offline, however, it was unable to accept these sludges. Accordingly, the sludges began to build up at the drinking water facilities, reducing their capacity to produce safe drinking water. If PVSC's WWTP could not be quickly brought back online or other alternatives be quickly found, the drinking water facilities would not be able to continue production of safe drinking water.

It was, thus, imperative that functionality be restored to PVSC as quickly as possible for purposes of both wastewater and drinking water treatment.

On October 31st at 10:40 pm, PSE&G restored power to PVSC's Substation 1, which feeds power to the rest of the WWTP. While this was a notable milestone and essential step, it did little to solve any of the aforementioned issues since the entire power distribution had been essentially destroyed and the WWTP's treatment systems could not function while the underground process galleries and tunnels remained flooded. Thus, PVSC remained without the ability to feed power to any treatment processes and even had that been possible, the treatment processes would still not have been operable.

Nevertheless, with power at least available in theory and flooding at least partially under control, PVSC began to focus on creating the proper sequence of activities necessary to bring the WWTP back to life. PVSC's treatment system can be broken down into four treatment process subsystems: Preliminary Treatment, Primary Treatment, Secondary Treatment, and Sludge Treatment. All of these are iterations of liquids/solids separation processes. All outfall discharges go through Secondary Treatment for additional treatment and disinfection prior to discharge. Solids are concentrated to a point where they are caked and shipped out of the plant for disposal. The Secondary Treatment process is a biological process that utilizes specialized bacteria to treat the wastewater. In order to "kick start" the Secondary Treatment process, bacteria from another wastewater treatment facility was trucked to PVSC and introduced into the process in order to "seed" it. Once power was restarted, PVSC worked to systematically energize key pieces of equipment and restart processes as conditions warranted with the goal of getting each of these treatment process subsystems functioning to a sufficient extent such that PVSC's treatment system would become functional.

The massive amounts of floodwater that swept through PVSC posed extreme challenges that hampered the systematic reenergizing and WWTP restart process. Approximately 200 million gallons of floodwater needed to be pumped out of the underground process galleries. The submergence of medium and high voltage electrical equipment, cabling and panels in a saltwater/sewage mix for long periods of time created extremely unsafe and potentially fatal working conditions. Unsanitary conditions caused by the presence of raw sewage caused omnipresent health threats of disease and infection to PVSC staff and other personnel. Sewage, silt, grime, and chemical residues remaining after floodwaters receded rendered the simple act of walking through the WWTP into a treacherous exercise. Facilities, equipment, and other inventory that had been badly damaged and soaked in raw sewage needed to be demolished and disposed of.

In order to alleviate pressure off of PVSC's sewage collection system and to alleviate environmental pressure off of the Passaic River and Newark Bay, PVSC first focused on restarting its wastewater effluent pumps, which pump flow to PVSC's main outfall, and its influent pumps, which lift sewage coming into the WWTP and allows it to flow through the facility aided by gravity. With the assistance of its federal and State partners, PVSC was able to restore the ability to pump flows through the WWTP on November 3rd. PVSC was also able to activate its effluent sodium hypochlorite dosing equipment to provide at least some disinfection of what was otherwise essentially untreated sewage now being pumped through the facility and to its main outfall.

Once PVSC was able to alleviate pressure off of the sewage collection system, the focus became getting the WWTP and its treatment processes back online. The first step was dewatering the lower levels and tunnels. PVSC did not have enough pumping resources to dewater the plant on its own and, therefore, solicited the aid of USACE's Unwatering SWAT Team. FEMA quickly approved this request and USACE mobilized a team and equipment to assist PVSC, designating the restoration of PVSC as its top priority above its many projects throughout the world. On November 10th, the combined PVSC-USACE team completed the removal of sea water and raw sewage from the lower level basements and process galleries, clarifier tanks and tunnels. As process areas and sections of tunnels were dewatered and protected from further flooding and water migration, PVSC mobilized all of the staff, equipment, rental equipment, and contractor services that it could muster to descend on these areas to start debris removal and building stabilization efforts in order to make these areas safe to work in. These efforts continued on a non-stop, 24-hour-per-day basis.

As soon as emergency work had progressed far enough to make the areas safe to work in, PVSC staff devised and implemented a strategy to energize and restart the process equipment. The initial focus was to activate enough of the treatment processes so that the WWTP could start functioning like a system again, not to make optimal repairs to every piece of damaged equipment or to bring the plant back to full operational capacity. This is important to keep in mind because none of the treatment processes can accomplish USEPA/NJDEP wastewater treatment objectives in isolation. Each iterative liquids/solids separation sequence in each treatment process refines the liquids/solids separation output until it is ready for final disposal, which is when it is able to meet New Jersey Pollutant Discharge Elimination System permit requirements.

The initial push involved activating equipment by any means necessary, even if that meant restarting damaged equipment or energizing bad wiring. If that did not work, then temporary

processes were set up. For example, PVSC's sludge treatment capability was being inhibited by a lack of ability to dewater the sludge. So again, with the assistance of USACE and quick approval from FEMA, PVSC was able to mobilize resources from an outside contractor, Synagro Technologies, Inc., and set up a temporary dewatering centrifuge operation, which is a crucial cog for not only the sludge treatment process but also PVSC's treatment system and was the last component necessary for PVSC to achieve NJDEP effluent secondary treatment standards. By November 23rd, enough treatment processes and temporary measures had been activated that the WWTP could now process sewage as a system and meet NJDEP permit requirements, although the latent effects of the catastrophic flood damages continued to cause equipment failures which prevented PVSC from consistently treating its effluent to secondary standards and managing biosolids at 100% capacity.

The prevention of treating to secondary standards and treating biosolids at 100% capacity continued to cause environmental concerns in the region. In addition to providing sewage treatment service to over 1.5 million New Jersey residents, PVSC also provides sewer service to approximately 1.96 million people through its LWA program. As part of PVSC's emergency preparations for Hurricane Sandy, LWA services had been suspended on October 29th. They continued to be suspended for this entire period and were only considered for resumption once PVSC's treatment systems were functioning enough to achieve secondary treatment standards. However, the NJDEP had other capacity and reliability criteria that they required of PVSC in order to allow PVSC to resume LWA services. PVSC satisfied NJDEP criteria on December 13th and received permission to resume LWA services that same day.

D. Commencement of Resiliency Planning

While the massive effort to get PVSC's treatment system activated again was being undertaken, PVSC was in constant contact with and receiving support from such key agencies as FEMA, USACE, USEPA, the Governor's Office, and NJDEP. In furtherance of Presidential Policy Directive No. 21 (Obama), the United States Department of Homeland Security (DHS), FEMA, and NJDEP identified PVSC as a critical component of New Jersey's infrastructure and recommended that the facility be protected from similar storm events. Guidance issued by FEMA called for the protection of wastewater treatment plants, as critical infrastructure, to the 500-year or 0.2% annual chance storm event.

Consensus quickly built amongst these key players that the narrowly-avoided public health catastrophe and ensuing environmental disaster caused by Hurricane Sandy's devastating blow to PVSC could not be allowed to happen again. Subsequently, a team was formed, comprised of representatives of PVSC, the State of New Jersey, and FEMA. Architects, scientists, engineers, public assistance specialists, cultural resource historians, and many others set their sights on the task of figuring out how to protect PVSC's critical regional wastewater treatment plant. Many ideas and concepts were presented and deliberated over during numerous meetings over the course of many months following the disaster. In the end, three hazards requiring mitigation were identified:

1. Prevention of storm surges from flooding the grounds of the WWTP;

2. Prevention of floodwater from filling up the WWTP's lower levels and tunnels; and

3. Prevention of a complete loss of power, regardless of the cause (natural disaster, service provider failure, man-made threat, etc.) of the loss.

These hazards pose an interconnected problem that calls for a systemic solution, because preventing any one or even two of the hazards without solving all three is insufficient. For example, having reliable backup power but no flood protection does little good since PVSC would need to do a phased shutdown to protect equipment and then the electrical distribution equipment and processes in the tunnels would be destroyed anyway, making power useless in the aftermath of the flood. Alternatively, if the tunnels and lower levels are protected from flooding while allowing the grounds to flood, but no power is available, the WWTP cannot function, and damage to buildings, vehicles, equipment, and processes would occur, resulting in imminent threats to public health and the environment. Thus, PVSC, its municipalities, all of the residents who depend on PVSC, the Passaic River, and Newark Bay would be in no better position than they were on the evening of October 29th and in the aftermath of Hurricane Sandy.

One of the key issues debated by the team was whether the measures taken should be site-specific within the WWTP or should they address the WWTP as a compound and/or whole system. For purposes of flood protection, this meant looking at protecting aboveground process infrastructure and buildings in isolation and coming up with individual site-specific flood proofing solutions versus addressing the WWTP as an entire compound (in reality, two separate compounds separated by Doremus Avenue) and protecting that entire compound by flood-proofing the perimeter, i.e., via construction of a floodwall. For purposes of having a reliable back-up power supply, this meant looking at site-specific distributed power generation across the entire PVSC treatment facility, where individual buildings and processes receive their own hookup to their own backup power generation versus installing a centralized backup power solution that distributes the generated power to the entire PVSC treatment system through the existing substation and power distribution network.

In the end, the team was able to identify the best possible solution that addressed the problem in a systemic way and protects the plant from damage from future similar and other events. That solution was the installation of a floodwall to be built around the perimeter of the WWTP. Construction of the floodwall would require that drainage systems be redone as well as the installation of pump stations to remove significant water from rainfall. However, the floodwall and associated work could result in a catastrophe should a power failure occur, as building the floodwall without the certainty of having reliable power to pump out the walled-in grounds would not alleviate the flooding hazard. Once the grounds start flooding, the lower levels fill up; once the lower levels are full, then the 140-plus acres of PVSC grounds become completely flooded. In order to energize the plant and restart treatment processes, PVSC would have to pump out the 140-plus acres now flooded before being able to even get into the plant to pump out the lower levels. Therefore, in addition to the floodwall, the team agreed that the solution required a reliable, centralized, onsite standby power system that is available in all weather conditions.

FEMA worked in close partnership with PVSC to develop this solution into a viable 406 Public Assistance Hazard Mitigation Proposal for the floodwall and onsite standby power system. The proposal, first presented in August 2013, considered alternatives for mitigating against damages caused by loss of power and storm surge. Alternatives for mitigating against power loss included:

1. Placement of an additional utility feed;

2. Use of standby power generators at each building/site at the PVSC WWTP; and

3. Construction of an on-site standby power generation facility at the PVSC WWTP. This alternative was ultimately selected as the preferred alternative due to the reliability of natural gas during storm events, the ease of constructability, and an economic analysis.

Alternatives for mitigating against storm surge included:

1. No action (it was determined that this alternative is infeasible);

2. Component flood proofing;

3. Elevation of the PVSC WWTP;

4. Relocation of the PVSC WWTP; and

5. Construction of a perimeter floodwall. This alternative was ultimately selected as the preferred alternative due to the fact that the selected alternative would result in the best protection of public health and the environment, least disruption to plant operations, the greatest functionality during a storm event, and the ease of constructability.

FEMA prepared its Passaic Valley Sewerage Commission Floodwall and On-Site Power System Environmental Assessment (the EA) in May 2014. Public comments were accepted on the EA in June and July 2014. Comments, including those submitted by the Ironbound Community Corporation (ICC), expressed concern about air quality impacts related to operation of the proposed SPGF. The comments included the following requests:

1. The SPGF project should include best available control technology, especially with respect to nitrogen oxides (NOx) emissions;

2. An evaluation should be conducted with respect to the use of sustainable energy sources as backup power supplies;

3. An evaluation of existing facility emissions should be conducted, especially emissions of particulate matters (PMs) PM_{10} and $PM_{2.5}$;

4. SPGF emissions should be mitigated to the maximum extent;

5. Standby power generation should not come from diesel engines;

6. A community air quality impact evaluation should be conducted; and

7. NJDEP should conduct a comprehensive facility-wide risk assessment including an evaluation of all equipment emitting hazardous air pollutants at the PVSC WWTP.

FEMA determined that the mitigation proposal directly protects eligible damages addressed under the public assistance program from future similar damages during a future similar event. Moreover, a detailed analysis was performed on the proposed mitigation whereby this proposal was determined to be the most practicable protection solution and a demonstrably prudent stewardship of taxpayer funds. A Benefit Cost Analysis was conducted with strict adherence to all published guidance, and a positive Benefit Cost Ratio above 1.0 was the result. Therefore, as per FEMA 9526.1 section VII.B.3, the proposed mitigation was determined to be cost effective.

In August 2014, FEMA issued a Finding of No Significant Impact, authorizing the project to move forward.

II. STANDBY POWER GENERATING FACILITY BASIC DESIGN

PVSC's well-documented importance to wastewater treatment, drinking water treatment, and overall public health in New Jersey cannot be overstated. Indeed, because it touches one out of every six people in the entire State on a daily basis, PVSC is the single most important piece of public health infrastructure in New Jersey. Accordingly, both FEMA and NJDEP directed PVSC to formulate and implement a resiliency plan to prevent PVSC from in the future (a) losing electrical power, and/or (b) having an interruption in service due to natural or man-made causes. The SPGF is a result of that directive. Thus, the SPGF cannot be considered in a vacuum. Rather, it is an integral part of one overall FEMA Hazard Mitigation Program plan, without which the plan will fail.

A. SPGF Design Parameters

The SPGF includes power generating equipment capable of producing 34 MW of net power and will be operated as a standby generation facility to support the entire PVSC electric load upon loss of utility power. Power will be generated from three combustion gas turbine generators configured in an N+1 arrangement to facilitate maintenance while providing the highest degree of reliability. The SPGF will be configured for operation only in island mode, meaning that it will not be capable of exporting power to the utility electrical grid; all power generated will be consumed onsite by the WWTP. To minimize disruption to the WWTP process, when utility electrical service is restored, the SPGF would parallel with the electrical utility service to seamlessly transfer the power source from the SPGF to the utility.

The SPGF is sized to provide the amount of power that will be needed for the plant upon completion of the entire FEMA Hazard Mitigation Program resiliency plan. The N+1 configuration previously mentioned means that two CTGs would operate in an emergency to supply the WWTP full power demand, while the third unit (the +1 or backup unit) would be available in case one of the other two units is not available for use due to repairs, damage sustained during an emergency, or any other reason. The CTGs were sized so that two could meet the 34-MW demand under any conditions. A turbine's capacity to produce power drops sharply at higher temperatures. The CTGs have been selected to be able to produce at least 17 MW (net) each at ambient temperatures of 99+ degrees Fahrenheit. The resulting design is for three CTGs, each with a maximum gross output of 28 MW. The CTGs were designed to be fueled with natural gas and would exhaust into the air emissions control equipment ductwork and casing. The facility is designed as an indoor plant with the combustion turbine and emissions controls (consisting of a vertical casing with oxidation catalyst and selective catalytic reduction (SCR) catalyst in the hot gas path) located indoors.

It is important to note that for purposes of applying for a Title V Air Permit modification, the maximum gross CTG output of 28 MW each has been used in all emission rate calculations and modeling. Actual operation would, of course, produce lower emissions.

Other major equipment is required to support the combustion gas turbine generators operation as the intent of the facility is to provide backup power under standby mode. These components, also configured in an N+1 arrangement, include two gas-fired black start engine generators (BSGs), three electric motor driven fuel gas reciprocating compressors, state-of-the-art

emission control equipment, medium-voltage synchronizing switchgear as well as other required auxiliary components for a fully functional and permitted facility. Finally, the facility would include two 164-kW diesel fire pump engines for fire suppression.

The SPGF building itself would consist of enclosed steel framing and precast architectural exterior paneling with grating platforms, ladders and stairways for personnel access to elevated areas within the building. Structures and equipment components are to be supported by suitable concrete foundations that includes shallow and deep foundations (piles).

Construction of the SPGF has progressed under three contracts: one to procure the power generation equipment, one to prepare the site, and one to construct the facility to house the equipment. In order to streamline the construction schedule as well as tailor the design and permitting documents around known equipment for this facility, PVSC issued the request for proposals for the power generation system equipment in 2018 and executed a contract for the same in 2019, Contract B129, with Siemens Energy, Inc., to provide all goods and special services required. The value of Contract B129 is $51,466,049. Fabrication is complete and the turbines are ready to be shipped to PVSC upon notice. Contract B128 consisted of preparing the proposed site for the construction SPGF by removing existing underground structures. Construction of this contract began in June 2019 and was completed in November 2020 for a total cost of $3,904,412.90.

The general construction contract will comprise the installation of all the highly specialized equipment being provided under the Siemens contract and coordinating with Siemens for the successful startup and testing of the equipment. In addition, the general construction contract will also include any civil site work, concrete foundations and equipment, pads, a new building to house the new equipment, HVAC, process piping and electrical work necessary for the new equipment. The site has been prepared for construction. Per the request of the Governor's Office, PVSC has not, to date, awarded the construction contract.

B. SPGF Operating Scenarios

1. Emergency Operation

The purpose of the SPGF is to provide reliable, indefinite, onsite power generation for PVSC operations in the event of emergency conditions resulting in a loss of power from the grid. Per N.J.A.C. 7:27-22.1, "emergency" is defined as any situation that arises from sudden and reasonably unforeseeable events beyond the control of an owner or operator of a facility, such as an unforeseen system capacity shortage caused by an act of God, that requires immediate corrective action to prevent system collapse or to restore normal operations at the facility.

Per N.J.A.C. 7:27-19.1, an emergency generator may only provide mechanical or thermal energy, or electrical power when the primary source of energy is unavailable and may only operate in the emergency mode:

1. When there is a power outage or the facility's primary source of mechanical or thermal energy fails because of an emergency;

2. When the power disruption results from construction, repair, or maintenance activity at the facility – limited to 30 days in any calendar year; or

3. When there is a voltage reduction issued by the Pennsylvania Jersey Maryland (PJM) Interconnection and posted on the PJM internet website (www.pjm.com) under the Emergency Procedures menu. This would be in anticipation of an imminent grid failure, which happens rarely.

The three CTGs, two BSGs, and two emergency fire pump engines are all considered emergency generators. Accordingly, there is no restrictions on the number of hours this equipment could operate during an emergency, but such operation must cease once the emergency is over.

In case of total loss of utility power, one of the 2.5 MW standby black start generators will automatically start and will support essential loads, including designated HVAC, battery chargers, turbine lube oil, selected lighting, and other loads required to facilitate the safe start-up of the SPGF. An automated sequence is then initiated by an Operator to start the fuel gas compressors and then the combustion turbines once conditions precedent have been met.

An uncontrolled shutdown of PVSC is equivalent to cutting off the power to over 36,000 homes at the same time. The major difference, however, is the complexity of the PVSC system when compared to the relative simplicity of restarting power to residences. To start a complex system requires a systematic approach to restore reliable source to ensure a stable power distribution system. The same systematic approach is required to restoring the treatment processes in order to maintain discharge permit requirements. Some processes are more complex than others, but it could take two days or longer to stabilize the treatment process.

The Operator will confirm all electrical switchgear and power distribution equipment downstream of the SPGF is configured to receive electrical power. This confirmation is required as specific breakers and switchgear will have tripped due to the power loss event. All downstream equipment from the tripped switchgear will need to be reset and restarted once the SPGF standby power is connected to the electrical distribution system. This equipment includes electric motors for influent, effluent and sludge pumps; instruments that control the treatment process; motorized process equipment and the like. Depending upon time of day, current maintenance work being performed and number of staff on site, the resetting of process and electrical equipment can be anywhere between two and five working days, at least. During this time the WWTP is vulnerable, and all treatment process and influent will need to be managed such that the facility is not internally flooded, creating a risk to flooding the adjacent neighborhoods.

Furthermore, the magnitude of load on the SPGF turbine generators is important. For the generators to operate in a stable and efficient operating region to meet emissions described in this facility's air permit application, they require at least 50% of their 27-megavolt-ampere nameplate load. Since the SPGF will not export electrical power to the grid and the SPGF is built to be a specific size to support the Newark Bay WWTP, approximately 15 MW of electrical load needs to be present on the Newark Bay WWTP electrical power distribution for the SPGF to be effective.

2. Non-Emergency Operation

The only "non-emergency conditions" in which the SPGF would be operated are (1) intended to ensure that the SPGF can fully function during emergency conditions; or (2) intended to provide stability to PSE&G's grid in the event of imminent brownout or blackout conditions. These scenarios include routine readiness testing and maintenance, demand response request, and storm preparation.

a. Readiness Testing and Maintenance

Non-emergency operation of the SPGF would occur for manufacturer-recommended routine readiness testing and normal maintenance. Maintenance and testing will be limited to a maximum of 100 hours per year for each CTG, BSG and fire pump engine. Routine testing and normal maintenance cannot take place on days when the NJDEP forecasts air quality anywhere in New Jersey to be unhealthy for sensitive groups, unhealthy, or very unhealthy, as defined in USEPA's Air Quality Index. (N.J.A.C. 7:27.19.2(d)).

b. Demand Response Request

Demand response operations would occur in accordance with the PJM Demand Response Program. PJM is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia, including New Jersey. PJM's Demand Response Program is a voluntary program that allows end use customers to reduce their electricity usage when requested by PJM. This ordinarily occurs when the reliability of the transmission grid is threatened to the point that brownouts or blackouts are likely to occur if such measures are not taken.

PVSC currently participates in the PJM Demand Response Program. PVSC responds to the PJM request by shedding load, or temporarily shutting down some processes to reduce electrical demand. The equipment operation curtailment can be for up to 12 consecutive hours. The list of equipment that is shut down or put on standby operation for the demand response request period includes the Zimpro sludge heat treatment system, the sludge filter press units, the decant and storage system, and half of the oxygenation units.

Continued participation in the program will increase reliability of the grid and increase resiliency of PVSC's operation. Reducing the risk of a blackout or brownout during high grid stress events means that community residents are less likely to be without heat on the coldest days of winter, to be without air conditioning on the hottest days of summer, and to have sewage backing up into basements and streets during such events. The most recent PJM-called event was over five years ago. For purposes of estimating worst-case emission rates, PVSC assumed that up to one event would be called per year and each event would last for up to 12 hours. PJM currently requires only one (1) one-hour performance test per year if no actual events are called. However, up to two (2) one-hour tests per year may be required by PJM in the future to cover each of the summer and winter demand response enrollment periods. Any such testing would, if possible, coincide with regular readiness and maintenance testing.

As with any other mode of SPGF operation, PVSC would disconnect from the grid and produce only enough power to support its own operations. This would provide benefit to the grid and reduce aggregate regional air emissions. As previously explained, no power would be (or could be) exported or sold to the grid. Taking PVSC offline from PSE&G's grid during a demand response event is the equivalent of taking every home located in the city of Clifton, New Jersey offline. This, in turn, reduces the stress on the grid because the grid does not need to work as hard to satisfy the power demands of the customers remaining online when they need that power the most, such as during extreme heat or extreme cold events.

c. Storm Preparation Mode

As noted above, an uncontrolled shutdown requires a sequential startup that could take multiple days to allow for treatment plant to stabilize. Accordingly, PVSC seeks approval to start the SPGF up to 48 hours in advance of major storms. The advance start allows for a seamless transition of the electrical power supply in the event of storm-caused utility power failure. PVSC engages in various emergency preparation procedures in advance of any potential severe weather events that could impact facility operations. In the past and depending on the projected severity of the event and potential impacts, PVSC has implemented emergency preparation procedures anywhere from the same day of the event to nine days ahead, with approximately 2.5 days in advance being the average. Different facilities may require differing amounts of lead time for emergency preparation.

FEMA, DHS, USEPA, and NJDEP have identified PVSC as a critical component of New Jersey's infrastructure. Fluctuations in PVSC's power supply can have severe impacts on operations, even when the fluctuations last less than one second. Because of uncertainty in storm tracks and severity, achieving a steady-state operation and completing tests on possible points of failure is critical.

Accordingly, and in order to ensure uninterrupted operation of PVSC's processes during an expected event with the potential to cause a power failure, PVSC would start the SPGF ahead of the expected event and transfer the electrical load from PSE&G's grid to the SPGF for operation in island mode. Action items would include starting the facility at least 24 hours in advance of the expected event, and up to 48 hours in advance if deemed necessary. Starting up the SPGF itself would take less than a half-hour. Connecting the SPGF to the facility's electrical systems would take several hours. If, however, the impending storm produces power fluctuations at PVSC, or if a sudden voltage variation occurs as equipment is being switched over to the SPGF, the power surge can damage equipment or take equipment offline. Starting the equipment in Storm Preparation Mode will allow PVSC to address any potential issues before the severe weather commences.

The parts of PVSC's operations that are most vulnerable to power fluctuations are the Zimpro Sludge Stabilization Units and the Oxygen Production Facility. The Zimpro Sludge Stabilization Units use high-pressure air and steam injection in reactors to oxidize the sludge in preparation for downstream processing. The time needed to start the sludge processing facilities is due to cold start of the reactors. To do a cold start, each reactor needs to be filled and then heated up via the boilers to get it up to the minimum temperature of 390°F before sludge processing can

begin. PVSC typically needs eight reactors to process sludge and not all eight can be brought online at the same time.

The Oxygen Production Facility produces 500 tons per day of 95 percent pure oxygen to support the aerobic bacteria secondary treatment process and is considered the lungs of the WWTP. Creation of high-purity oxygen is driven by an 8000-horsepower electric compressor. If an air compressor were to unexpectedly shut down due to a voltage spike, it could take a minimum of two days to restart the oxygen generation system. Based on experience, the impact to the biological secondary process is evident in a matter of hours and can potentially impact PVSC's ability to meet its New Jersey Pollutant Discharge Elimination System Permit conditions.

It is, thus, critical that the switchover electrical connections be made deliberately and safely – and, if at all possible, without haste – in order to achieve reliable steady-state operation of the entire facility in island mode. Attempting to make the connection at the moment a storm arrives or after power has already been lost jeopardizes PVSC's staff, PVSC's ability to operate during critical times, public health and safety, and the environment.

PVSC has tracked the number of emergency preparation alerts that it has issued over the last nine years due to storms. The highest number was six, in 2020, with a generally increasing trend in the frequency of storm alerts over the course of the entire time period. If storm frequency continues to increase at the same rate as in the last nine years, then one would expect approximately 10 storm alerts per year at PVSC by the year 2030. (The life of the SPGF equipment is expected to be 20 years or more.) On this basis, PVSC requested that each of two CTGs be permitted to operate for up to 480 hours/year (48 hours in advance of up to 10 storms/year) for Storm Anticipation Mode. Again, that is a maximum number; the actual number will almost certainly be less.

d. Startup and Shutdown Emissions

During CTG startup and shutdown, emission rates would be higher than during steady-state operation. This is due to the fact that in order for advanced emissions control equipment to function, the operating temperature of the CTGs must be at or above a certain level. During the phases of startup and shut down that necessarily occur below that level, such as while the CTGs are warming up or cooling down, the emissions rates are higher than during steady-state operation. The increased emissions levels occur for only a short period of the operations. NJDEP issued guidance (https://www.state.nj.us/dep/aqpp/permitguide/SSM.pdf) on August 9, 2018, requiring that startup and shutdown emissions be included as a separate operating scenario in permit applications. The guidance states that emission rates must be in compliance with Reasonably Available Control Technology (RACT) rules, and that startup and shutdown emissions must be included in calculations of annual emission rates in tons per year. Additionally, NJDEP requested for the permit application that CTG startup and shutdown emissions be considered both for RACT compliance and for the Health Risk Assessment.

1. Startup

Non-emergency startups would occur for readiness testing and maintenance – once per month or 12 times per year for each of the three CTGs. Non-emergency startups would also occur

for Demand Response, described above – up to three startups per year for each of two CTGs. In addition, up to 10 startups per year for each of two CTGs would occur for Storm Preparation Mode. Each CTG startup is designed to be 10 minutes or less due to the project's emergency response purpose. However, in the worst case, it could take up to 25 minutes from a cold condition to achieve steady state operation. Therefore, 25 minutes per startup was used for emission rate calculations.

2. Shutdown

This operating scenario accounts for the increased emissions that occur as each CTG is transitioned from steady state operation to shut down. The maximum number of non-emergency shutdowns per year would be the same as for the Startup Scenario – 12 times per year for each of three CTGs for testing/maintenance, three times per year for each of two CTGs for Demand Response, and 10 times per year for each of two CTGs for Storm Preparation Mode. It is assumed that each CTG shutdown could take up to 10 minutes.

C. Summary Operations Table

Table 1 shows the breakdown of operating hours for the CTGs for non-emergency purposes and for startup and shutdown.

Table 1 CTG Operating Scenarios and Proposed Maximum Non-Emergency Annual Hours of Operation

	Maximum Potential Non-Emergency Operating Hours	
Scenario	**Hours/Year**	**Basis**
Readiness Testing and Maintenance		
Startup	5.0	12 startups/year at 25 minutes each
Shutdown	2.0	12 shutdowns/year at 10 minutes each
Steady State	93.0	Testing/maintenance would be conducted once/month, 12 times/year. Up to 100 hours/year is allowed for each CTG. Value revised to be calculated as difference between 100 hours/year and seven hours/year for startup/shutdown
Subtotal	**100**	
PJM Demand Response		
PJM Called Event	10	Estimated at one event per year and 10 hours/event
PJM Performance Tests	2	Up to two 1-hour performance tests per year could be required by PJM.
Startup	1.25	Three startups/year at 25 minutes each
Shutdown	0.5	Three shutdowns/year at 10 minutes each
Steady State	10.25	Difference between 12 hours/year and time needed for startup and shutdown.
Subtotal	**12**	
Storm Preparation Mode		
Startup	4.17	10 startups/year at 25 minutes each
Shutdown	1.67	10 shutdowns/year at 10 minutes each
Steady State	474.2	Difference between 480 hours/year and time needed for startup and shutdown
Subtotal	**480**	SPGF would be started 48 hours in advance of up to 10 storms per year.
Grand Total	**592**	
Operating Hours		
Facility Total	**One CTG**	**Three CTGs** (two CTGs for first test run; one for second test run)
Steady State	577.42	**1247.83**
Startup	10.42	**25.83**
Shutdown	4.17	**10.33**
Total	**592.00**	**1284.00**

III. ADMINISTRATIVE HISTORY OF TITLE V PERMIT APPLICATION

On February 7, 2017, PVSC and NJDEP's Air Quality group held a Title V Air Permit Modification pre-application meeting. This meeting provided a general overview of the project and discussions on the Title V Air Permit process. NJDEP confirmed that the Title V Permit modification application should be submitted after PVSC selected equipment to be used for the SPGF. NJDEP also approved purchase of SPGF equipment prior to submission of the permit application.

During 2017 and early 2018, PVSC's design team identified and reviewed various equipment for potential use in the SPGF. PVSC then submitted proposed contracting bid documents to NJDEP for review. The bid documents called for the fabrication and delivery of the power generating equipment for the Standby Power Generating Facility necessary for completion of the FEMA Hazard Mitigation Program resiliency project being undertaken by PVSC.

On May 24, 2018, NJDEP responded to PVSC and requested only one change to the contracting bid documents – to advise bidders of a specific bid opening date and to ensure that such date not fall on a Monday or a day after a state or federal holiday.

PVSC revised the bid documents accordingly and, on July 5, 2018, NJDEP authorized PVSC to issue a request for proposals for what became PVSC Contract B129.

On May 6, 2019, PVSC's design team recommended selection of Siemens model STG-600 CTGs for the project. On May 16, 2019, PVSC passed a resolution approving the award of Contract B129 to Siemens, subject to NJDEP approval. On June 17, 2019, NJDEP authorized PVSC to award Contract B129. The parties signed the contract on July 10, 2019, and on July 16, 2019, PVSC authorized Siemens to proceed with performance.

Contract B129 called for the fabrication and delivery of the CTGS to occur no later than 700 days from the date of the notice to proceed. With this timeline in mind, PVSC turned back to the air permitting process, seeking to have the permit in place prior to the delivery of the CTGs to allow for a more seamless installation process.

In October 2019, PVSC and its Design Engineer met again with NJDEP's Air Quality Group to discuss specific emissions data and the next steps in the air permitting application process. In November 2019, NJDEP advised PVSC that PVSC should submit its Title V Air Permit Modification application.

On January 27, 2020, PVSC submitted the initial Title V Air Permit Modification application. The initial application included running the CTGs and BSGs only during normal steady-state operations (testing and maintenance) or emergency hours.

On January 30, 2020, NJDEP contacted PVSC and suggested that should PVSC desire to operate the SPGF during non-emergency operations hours, such as for demand response, peak load management, or storm preparation mode, the application should be revised to include those hours as well, noting that it would be difficult to add such hours in the future. On February 4, 2020, PVSC withdrew the initial application and began to work on the suggested revisions.

On March 5, 2020, PVSC met again with NJDEP's Air Quality group. NJDEP advised that PVSC's application did not appear to be difficult to review from a technical standpoint, and that the low air emissions rates, due to PVSC's inclusion of non-mandatory, state-of-the-art air emissions control features, should expedite approval. NJDEP requested that the revised application include a discussion on community engagement, a discussion on greenhouse gas emissions, a basis for the proposed emission rates, a description of applicable State and federal rules, and further-refined dispersion modeling for acrolein emissions. NJDEP confirmed that it could issue Pre-Construction Approval for the Project before the final Title V Air Permit Modification was approved if requested. This would allow early commencement of construction and connection of equipment.

PVSC spent the next several months revising the specifications of its permit application. When the revisions were complete, PVSC next followed NJDEP's guidance with respect to engaging in additional public outreach. The guidance, based on Executive Order No. 23 (Murphy), was as follows:

1. PVSC should submit the revised application to ICC representatives for early consultation review before submitting it to the NJDEP Bureau of Stationary Sources.

2. PVSC should conduct a public information session with the Ironbound Community to present the proposed SPGF Project. This early consultation meeting would be in addition to the public hearing required for the draft Title V Air Permit Modification. A record of this meeting was to be submitted with the air permit application.

3. PVSC should perform refined air dispersion modeling of SPGF toxic air pollutants requiring further evaluation after the Level 1 Risk Screening analysis. The NJDEP Bureau of Stationary Sources normally performs this Level 2 modeling after the air permit application is submitted (NJDEP Technical Manual 1003). However, in this case, NJDEP agreed that PVSC should prepare a draft protocol and conduct preliminary modeling (to be reviewed by NJDEP after the application is submitted) in order to provide information on possible public health stressors to the Ironbound Community.[1]

On December 14, 2020, PVSC provided a draft revised Title V Air Permit Modification application to ICC for review. The draft application included the proposed run-time hours for non-emergency operations for Peak Load Management, Storm Preparation Mode, and Demand Response. On January 7, 2021, PVSC held a public information session with ICC and received comments on the revised application.

On January 14, 2021, PVSC submitted the revised Title V Air Permit Modification application to NJDEP for approval. The revised application included the comments from ICC,

[1] The guidance items roughly mimic the sort of public outreach and analysis that is now contemplated by P.L. 2020, c. 92, commonly known as the New Jersey Environmental Justice Law. The Environmental Justice Law did not come into existence until September 18, 2020, more than three years after the process leading to the issuance of Contract B129 began and more than one year after performance under Contract B129 began.

PVSC's responses to those comments, and changes made to the application in response to those comments. On February 4, 2021, NJDEP issued a notice of Administrative Completeness with regard to the revised application, leaving only a technical review remaining to be completed.

Over the course of the next several months, PVSC continued to receive public comments. PVSC discussed the comments with NJDEP and representatives of the Governor's Office, leading PVSC to propose removal of operating hours for Peak Load Management from the revised permit application. This action alone would cut down anticipated hours of SPGF operation by approximately one-third.

On June 10, 2021, PVSC withdrew the revised Title V Air Permit Modification application. On July 2, 2021, PVSC submitted a second revised application (the third application overall), eliminating operation of the SPGF for purposes of Peak Load Management. On July 2, 2021, NJDEP declared the second revised application to be administratively complete, again leaving only a technical review of the application remaining to be completed. That review is currently ongoing.

IV. STAKEHOLDER AND PUBLIC ENGAGEMENT

PVSC began public outreach meetings with regard to resiliency planning immediately after Hurricane Sandy. All of the meetings were preceded with advertisements. PVSC has always been dedicated to public health and environmental protection and that dedication continued with public engagement for the resiliency planning project, including the SPGF. While public outreach was open to all, PVSC specifically focused on the Ironbound Community Corporation, one of PVSC's nearest neighbors, to discuss the proposed resiliency projects, including the SPGF. Along with ICC, other attendees included, but were not limited to, community members and the New Jersey River and Baykeepers Association.

1. November 19, 2012 (at PVSC)
2. December 19, 2013 (at PVSC)
3. September 29, 2015 (at PVSC)
4. December 15, 2015 (at PVSC)
5. March 31, 2016 (at the Ironbound Community School)
6. July 17, 2017 (at PVSC)
7. June 28, 2018 (at PVSC)

On December 14, 2020, PVSC submitted a draft of the Title V Operating Permit Modification application to ICC representatives for review. On January 7, 2021, PVSC conducted a public information session. The following questions and concerns were raised by community members about the resiliency projects, including the SPGF. PVSC's responses are included:

1. Construction truck traffic and its effects on the local streets and community.

Response: PVSC advised that construction vehicles delivering materials and concrete would primarily travel to the PVSC facility directly from the New Jersey Turnpike via Port Street and/or Doremus Avenue. The City of Newark reviews and permits truck travel along designated city streets. PVSC committed to work with the City of Newark to identify construction traffic routes that would minimize impact to the community.

2. Air quality concerns when the SPGF is tested and exercised.

Response: PVSC agreed to provide ICC: (1) advance notice of when PVSC performs required tests of the power generating facility, and (2) After Action Reports containing the results of all such testing.

In addition, FEMA prepared the Passaic Valley Sewerage Commission Floodwall and On-Site Power System Environmental Assessment (EA) in May 2014. Public comments were accepted on the EA in June and July of 2014. The ICC submitted comments expressing concern about air quality impacts from operation of the SPGF. The comments included the following requests:

1. The project should include best available control technology (especially for NOx emissions) for the SPGF;

2. The use of sustainable energy sources as backup power supplies should be evaluated;

3. Existing facility emissions (especially emissions of PM10 and PM2.5) should be reported;

4. SPGF emissions should be mitigated to the maximum extent;

5. Backup power generation should not come from diesel engines;

6. FEMA/NJDEP should conduct a community air quality impact evaluation; and

7. FEMA/NJDEP should conduct a comprehensive facility-wide risk assessment that includes all equipment emitting hazardous air pollutants (HAPs) at the PVSC facility.

PVSC took each of these comments into account when designing the SPGF. In keeping with best design principles and PVSC's commitment to the environment, PVSC designed the SPGF to provide for maximum mitigation of air emissions, including the best available control technology and NJDEP-approved state-of-the-art control technology for the CTGs. These controls will result in air emissions levels that are below what is required by current NJDEP regulations. As further discussed in this Statement, PVSC conducted an evaluation to determine whether the use of sustainable energy sources for the SPGF was feasible. Further, none of the proposed standby power generation would come from diesel engines. The project would include two small (164 kW) diesel emergency fire pump engines, but these engines would not produce electrical power.

Following the January 2021 meeting, PVSC received additional inquiries about the SPGF project. PVSC received and responded to a number of requests for government records regarding the project under the New Jersey Open Public Records Act. In addition, PVSC senior management has held (and continues to hold) virtual meetings with parties interested in the project in order to provide answers to questions about the project.

PVSC remains fully committed to addressing the public's concerns. PVSC is not only by far New Jersey's oldest entity dedicated to environmental protection, it is one of the oldest such entities in the United States. Accordingly, and in full consultation with the Governor's Office and NJDEP, PVSC embarked on a full-scale round of additional public outreach, interaction, and discourse regarding the SPGF project. These activities, announced by PVSC at its monthly public Commissioners Meeting on June 10, 2021, have included the following:

1. **Elimination of Peak Load Management.** As previously discussed, and along with operating the SPGF during natural disaster events, PVSC had also planned to operate the SPGF during times when PSE&G's grid was experiencing peak loading conditions. Operating the SPGF during those times – typically when the weather is extremely hot and many people are using their air conditioners, or when it is very cold and many people are using heaters – would have increased the reliability of the power supply to local residents, thus avoiding brownouts and blackouts. PVSC estimated that peak load management operation of the SPGF would have required approximately 720 hours of operating time per year. In response to the concerns raised by members of the public, PVSC withdrew its original Title V Permit Modification Application and resubmitted it without seeking approval to operate the SPGF for Peak Load Management.

2. **Construction of SPGF Building.** The opening of bid proposals for construction of the SPGF building was originally scheduled for June 29, 2021. PVSC extended the overall bid opening and award process for six months in order to give stakeholders adequate time to present additional comments and ideas to PVSC, and for PVSC to meet with technical consultants to discuss further ways in which the SPGF might be reimagined to address public concerns. At the request of the Governor's Office, PVSC has still not awarded the contract in order to allow for even further additional public outreach.

3. **Public Meetings.** PVSC has conducted four additional public stakeholder virtual meetings dedicated solely to discussing the SPGF project and community concerns surrounding it. The meetings were held on July 22, 2021, August 12, 2021, September 23, 2021, and December 16, 2021. Due to COVID-19 restrictions, PVSC was not able to hold the meetings in person. The meetings were advertised online and in English, Spanish, and Portuguese language newspapers, and were conducted in English, with Spanish and Portuguese closed captioning made available. Further, native-speaker Spanish and Portuguese translators were available online for questions. PVSC answered every question raised and transcripts of the meetings and the presentations given were made available to the public in English, Spanish, and Portuguese. Topics for the meetings included:

    a. The need for the SPGF and impacts to the community and the environment if it is not built;

    b. PVSC's partnerships with federal and State agencies on the concept and design of the overall resiliency project and the SPGF in particular;

    c. The intended operational parameters of the SPGF;

    d. PVSC's initial review of renewable energy technologies and why they were determined to not be feasible;

    e. The financing structure behind the overall resiliency project; and

f. Alternative proposals for SPGF fuel sources.

4. **Local Stakeholder Meetings.** Recognizing its role as part of the Newark community, PVSC also reached out directly to the City of Newark, the Ironbound Community Corporation, Newark DIG, and other local groups to meet with them to discuss the SPGF. PVSC gave separate presentations to some of these groups and remains committed to meeting with them at their convenience.

5. **Public Alternative Proposals Day.** PVSC set aside August 24, 2021, as a Public Innovation Day. PVSC made its technical and administrative staff, including PVSC's Engineer of Record and the SPGF Project Management Team, available to meet with any stakeholder regarding alternative fueling methods for the SPGF.

6. **Meeting with Industry Consultants.** PVSC collaborated with community stakeholders to devise an "RFP Lite" – an unofficial request for proposals concerning the SPGF project. Through our community contacts, the RFP Lite was sent to over three hundred industry consultants around the United States and beyond. PVSC received six confidential written responses and met with five of those consultants in person. Each respondent was afforded a complete plant tour, discussions with PVSC's technical team, access to all relevant data and information, and follow up meetings as requested.

7. **Retention of Energy Consultant.** While PVSC and stakeholders were reviewing the plans for the SPGF, PVSC retained an energy consultant to evaluate PVSC's regular operations in order to determine areas in which PVSC can further reduce carbon emissions. Part of the retention agreement includes public participation and input at the beginning, during, and at the end of the evaluation, with a public presentation on the findings. The evaluation will consider all aspects of PVSC's operations and will place special emphasis on innovative use of existing and cutting edge, proven sustainable technologies.

8. **Creation of Dedicated Public Website and Social Media Accounts.** At the suggestion of stakeholders, PVSC created a public website and social media accounts dedicated solely to providing information regarding PVSC's SPGF and future sustainability plans. The website is available at bit.ly/SPGFProject. PVSC posts all presentations, transcripts of meetings, and other associated materials to the website, and all documents are available in English, Spanish, and Portuguese.

9. **Commitment to Regular Public Outreach**. In addition to the public outreach that has already been completed, PVSC has committed to further, regular public outreach on this project. PVSC is already doing so with regard to other large-scale projects. For example, PVSC has conducted five years of public outreach meetings with regard to its CSO Long Term Control Plan. An additional meeting regarding the SPGF is being planned for Spring 2022.

10. **Development of an Energy Sustainability Roadmap**. Started in 2020 at the direction of the PVSC Commissioners, PVSC and its consultants have developed an Energy Sustainability Roadmap. At the December 16, 2021 public meeting, PVSC announced multiple opportunities to make changes to the current WWTP facility that will reduce environmental health stressors in the local community as well as reduce overall greenhouse gas emissions. Discussed in more detail below, these net benefits are achieved with the SPGF in operation as planned, thus serving both goals of reducing air pollution and providing uninterrupted sewer service in the affected communities.

In total, PVSC and its partners have held 14 public meetings regarding the SPGF project to date, with future additional outreach being planned. PVSC has also received public input regarding the SPGF at its last nine monthly public Commissioners Meetings. PVSC has also held individual meetings and had other communications with stakeholders. At the most recent SPGF public meeting on December 16, 2021, it was noted by a member of the Newark Environmental Commission that the level of public outreach in which PVSC has engaged on the SPGF project is unprecedented.

V. CHANGES TO PROJECT SCOPE

PVSC has made a number of changes with regard to the SPGF project as originally envisioned. These changes were based on continued design team discussions, input from PVSC's regulators, input from the public, and at the direction of PVSC's Commissioners.

As a starting point, PVSC looked at comments submitted to USEPA by the Ironbound Community Corporation in 2014 as part of USEPA's Environmental Analysis of the overall FEMA Hazard Mitigation Program resiliency project. Those comments, and PVSC's actions in response, were as follows:

1. The project should include best available control technology (especially for NOx emissions) for the SPGF.

   Response: PVSC designed the SPGF to include state-of-the-art air emissions controls that go beyond NJDEP air emissions requirements.

2. The use of sustainable energy sources as backup power supplies should be evaluated.

   Response: The use of sustainable energy as an overall power supply at PVSC was evaluated in 2012. It was also evaluated as part of PVSC's Title V Air Permit Modification Application, submitted in January 2020, and PVSC revisited its use again in 2021. As a result of the reevaluation, PVSC requested permission in 2021 from the State of New Jersey to install 18MW of solar-power generation capability.

3. Existing facility emissions (especially emissions of PM10 and PM2.5) should be reported.

   Response: Facility emissions are reported for the parameters identified.

4. SPGF emissions should be mitigated to the maximum extent.

   Response: In addition to installing state-of-the-art emissions control systems to the SPGF, PVSC narrowly limited the hours of operation of the SPGF. During a year in which no emergency operation takes place, the SPGF will be offline for 353 days, operating for 12 days maximum. During a year in which emergency operation does take place, PVSC anticipated that the SPGF will operated for 41 days, meaning the plant will be offline for 324 days. Further, the SPGF is incapable of exporting power to the grid; accordingly, it is not feasible to operate the facility outside of permit parameters.

5. Backup power generation should not come from diesel engines.

   The use of diesel engines for power generation was never considered in the SPGF's design and specifically excluded from consideration after receipt of this comment.

The proposed CTGs and BSGs would be natural-gas-fired. The project would include two small 164-kW diesel fire pump engines. Only one would operate at a time. In response to public comment, PVSC now proposes to supplement the black start generators with five MW (10 MWh) of on-site battery storage. This would be enough to start the CTGs in the event of total loss of utility power, and make use of the BSGs necessary only if the batteries fail. PVSC is also considering use of renewable fuel in the fire pump engines.

6. FEMA/NJDEP should conduct a community air quality impact evaluation.

   Response: Air quality impact studies were performed both by USEPA as part of its 2014 Environmental Analysis and by PVSC for submission of its 2021 Title V Air Permit Modification Application. This analysis is described in Section VII, below.

7. FEMA/NJDEP should conduct a comprehensive facility-wide risk assessment that includes all equipment emitting HAPs at the PVSC facility.

   Response: Air quality incremental impact studies were performed both by USEPA as part of its 2014 Environmental Analysis and by PVSC for submission of its Title V Air Permit Modification Application. NJDEP conducted comprehensive facility-wide inhalation health risk assessments in 2012 and in 2016 for the PVSC WWTP. NJDEP determined that the facility-wide health risk was acceptable. As part of its technical review of the Title V Air Permit Modification Application, the NJDEP has requested that the facility-wide health risk assessment modeling be updated. This work is ongoing.

In addition to the steps above, PVSC has already taken or committed to taking the following additional steps, all of which are in response to public comment:

8. Reduction of runtime. PVSC had anticipated running the SPGF for purposes of peak shaving. Peak shaving would have involved operation of the SPGF during periods of high stress/demand on the PSE&G transmission grid, thus providing additional stability to the grid during those times for residential and other consumers. Elimination of this use eliminated over 700 hours of estimated runtime.

9. Installation of solar project. As previously stated, PVSC has applied to the State's TREC Program for the installation of 18 MW of solar power. PVSC anticipates using such power to charge batteries for use in connection with the SPGF black start generators and fire pump engines. PVSC also anticipates using the solar power to develop green renewable fuels for use in the SPGF and in PVSC's day-to-day operations.

10. Incorporation of hybrid microgrid concept. PVSC proposes to complete the SPGF as part of a hybrid microgrid to meet FEMA/NJDEP resiliency requirements while maintaining uninterrupted, sustained operations of the WWTP during emergency events.

11. Conversion of CTGs to use of Green Advanced Renewable Fuels as quickly as practicable. Based on discussions with the manufacturer, PVSC anticipates full conversion within 10 years at the latest. By the time of installation, the manufacturer of the CTGs anticipates that the CTGs will accept 65% hydrogen, with the goal of being 100% hydrogen capable by 2030. PVSC plans that any hydrogen utilized will be green hydrogen produced from renewable sources, such as onsite electrolysis using solar power.

12. Add Advanced Emission Controls to existing plant equipment where applicable.

13. Complete design and begin construction of Oxygen Production Facility upgrades to include elimination of the existing boilers. This will reduce overall energy consumption and decrease air emissions both onsite and from the grid.

14. Install five MW/10 MWh modular batteries. PVSC would use this capability to provide a limited amount of backup power as well as for other applications, such as improving power quality to the facility.

15. De-commission 600-kW Headend emergency standby diesel engine generator and boilers.

16. De-commission the Grit and Screenings facility boilers.

17. Potential De-commissioning the OEM building boilers.

As further described below, all of these measures align with the State's 2050 Energy Master Plan and fully support the New Jersey Environmental Justice Law.

VI. ALTERNATIVES ANALYSIS

As part of the original Title V Permit Modification application, PVSC performed an analysis to evaluate alternatives to the construction of a new 34-MW fossil-fuel-fired power plant, as well as options to maximize the energy efficiency of the plant. Further, as previously stated and in response to comments from the public, the Governor's Office, and NJDEP, PVSC revisited the original analysis and sought additional input from industry consultants. The technologies investigated and the results of the meetings with industries investigated are summarized below.

While PVSC continues to collaborate with industry experts on increasing renewable energy and renewable fuel sources for operating PVSC facilities, the current SPGF plan is the preferred option for providing the onsite, continuous, and reliable energy required during a severe weather event and power outage. As described below, there are significant challenges to relying on renewable energy and battery storage for the emergency standby function at this scale. In the case of battery storage, current battery storage technology only provides four to six hours duration of power. The number of batteries that would be required to provide 34 MW of uninterrupted electric service for 14 days far exceeds the space available at PVSC. Similarly, solar and wind are intermittent power resources that cannot be available 24/7 for 14 days

A. Energy Storage – Batteries

The PVSC Wastewater Treatment Plant historical average and maximum electrical power demand is 23 megawatts (MW) and 28 MW, respectively. The current planned power consumption is 34 MW to accommodate new flood mitigation measures being implemented under the FEMA Resiliency Program. The proposed SPGF and its auxiliary components are being designed for an electrical utility outage lasting 14 continuous days. Therefore, the SPGF must provide 34 MW times 336 hours, or 11,424 megawatt-hours (MWh) of electricity.

The highest capacity platform-style battery storage system available is the Samsung SDI 22S Module. This Module, which fits in an International Standards Organization (ISO) Standard Container (40 ft. (L) x 8 ft. (W) x 8.5 ft. (H)), has a storage capacity of six MWh. A total of 1,904 units of the 22S Module would be required to meet the project's power requirements. Each six-MWh unit has a footprint of 320 square feet (40 feet long by eight feet wide). Approximately 14 acres of land would be required to arrange these units side by side and end to end. If space allowed, this facility would be approximately 10 times the size of the largest battery storage facility currently in the world.

PVSC has an extremely limited inventory of available land. The area allotted for the SPGF is 1.5 acres. Other available free space on the PVSC property totals seven acres. If the units were stacked vertically on the 1.5-acre SPGF site (and allowing for access between the towers and space for structural support), the overall height of this arrangement would be more than 200 feet above grade. This arrangement is not physically possible, as well as likely not permissible at this location, which is only 1.5 miles from Newark International Airport. Therefore, battery storage is considered a technically infeasible option for replacing the SPGF.

PVSC has found that it would be feasible to install up to five MW of battery storage capacity that could operate for up to two hours. Although not enough to replace the SPGF (34 MW needed for up to two weeks), these batteries could provide some black start capability for the SPGF. These batteries could also supplement facility operating electricity usage, particularly during peak power demand on the grid. See Section VIII. Reduction to Public Health Stressors, below, for a more detailed discussion of other alternatives considered, and for the emissions benefits of installing five MW of battery power on PVSC's site.

B. Solar Power

In March 2012, PVSC conducted a plant-wide solar feasibility study. The purpose of the study was to determine feasibility of developing an emission-free energy source by installing photovoltaic (PV) solar systems, reducing the demand on local utility, and providing financial benefit by offsetting electricity costs. The analysis included investigating ownership options of PVSC-owned and -operated PV systems, and various power purchase agreement provider owned and operated PV systems. Since 2012, the potential to generate more electricity from the same size units has increased. As a result, the 2012 report has been re-evaluated in 2021 to reflect changes in estimated system size, and output.

The results show that the PV system's total maximum gross power output would be 10,629 kW, or 10.6 MW. This is what the panels could produce on a sunny day. This is only 31 percent of the 34 MW needed to run PVSC's equipment in an emergency. Furthermore, a PV system cannot be solely relied upon as a standby power source during cloudy and rainy days. As a result, the PV systems are only recommended to be used with full battery backup of a facility as discussed above. However, 34 MW of battery storage is considered a technically infeasible option for the SPGF.

Therefore, solar power by itself is technically infeasible because it is not possible to provide 34 MW and it is not possible to provide the necessary battery storage.

PVSC has found that it would be feasible to install up to eight MW of solar panels at the facility. Although not enough to replace the SPGF (34 MW needed for up to two weeks), these solar panels could supplement facility operating electricity usage, especially in combination with the five MW of battery storage described above. See Section VIII. Reduction to Public Health Stressors, below, for a more detailed discussion of other offsite solar alternatives considered, and for the emissions benefits of installing eight MW of solar panels on PVSC's site.

C. Wind Power

PVSC also investigated wind power energy generation. The National Renewable Energy Laboratory (NREL) notes that, areas with annual average wind speeds around 6.5m/s and greater are generally considered to have a resource suitable for wind development. NREL wind maps show that the site of PVSC has an annual average wind speed of 5.5m/s at 80m (~260'). Accordingly, PVSC is not located in an area that is suitable for power generation using wind.

Additional challenges include: height restrictions based on proximity to Newark International Airport, footprint required for 34 MW of wind turbines, and reliability of wind flow. The Federal Aviation Administration (FAA) requires wind turbines over 60 meters (200 feet) in height to be analyzed by the FAA for impact on surrounding airspace. Furthermore, the NREL map shows that the location of PVSC is excluded from installation of wind turbines at 110 meters (360 feet). This would exclude most utility scale (>1MW) wind turbines as a potential solution and using thousands of smaller wind turbines is not feasible due to the size of the system required to be built. In addition, wind is only recommended to be used only with full battery backup of a facility, because wind cannot reliably be counted on to provide power in an emergency. However, battery storage is considered a technically infeasible option for complete replacement of the SPGF. Therefore, wind power is technically infeasible for replacing the SPGF, because it is not possible to provide 34 MW and it is not possible to provide the necessary battery storage.

PVSC has not identified options for partial electricity generation with wind, as it has for solar panels and batteries. This is because PVSC's site receives insufficient wind to be a useful energy resource, and tall structures are constrained by proximity to the Newark International Airport. The "RFP Lite" process initiated with stakeholders to explore alternative energy options (see Section VIII, below) also did not produce any wind energy options.

D. Energy Efficiency

The purpose of the SPGF project is to provide reliable standby power generation to support the WWTP's range of electrical power demand as quickly as possible from the time utility electrical power is lost. The planned 34-MW power consumption is designed to be fully available from the CTGs within 10 minutes upon loss of electrical utility power. The worst-case startup time would be 25 minutes for a cold start condition.

The SPGF is arranged in an N+1 simple cycle configuration and is based on the selected Siemens SGT-600 CTG. At ISO conditions, the SGT-600 machine can produce 25.3 MW power at a gross efficiency of 34.6%. The SGT-600 gross efficiency is typical for the industrial gas turbine market, which spans the power output range of five to 100 MW.

Alternatively, General Electric's proposed machine for the SPGF, the LM2500DLE CTG, has a gross efficiency of 35.9% but only produces 22.7 MW at the same ISO conditions compared to the 25.3 MW of the project's selected combustion turbine.

Combined cycle power generating facilities have approximately 50% gross efficiencies depending on the CTG and matched heat recovery steam generator (HRSG) and steam turbine generator (STG). Even though they can achieve higher efficiencies compared to simple cycle plants, combined cycle power plants have longer startup durations and are not well suited to meet the response time to restore power for the WWTP. Combined cycle facilities are restricted by the HRSG and STG in that the large thermal imbalance between the CTG exhaust and cold state of the HRSG and STG requires the CTG to be loaded slowly and gradually. This procedure is required to prevent damage to the STG and auxiliary equipment from thermal shock. The typical startup duration to reach full load is three hours and is significantly longer than the project's requirement for a timely restoration of power.

Combined Heat and Power (CHP) plants, which lack the STG component of combined cycle plants, have lower efficiencies than simple cycle plants due to additional CTG backpressure created by the heat recovery steam generator. Therefore, CHP was not considered a viable solution for the SPGF.

Therefore, neither combined cycle nor CHP are considered technically feasible options for the SPGF.

VII. ENVIRONMENTAL IMPACTS TO HOST COMMUNITY

An incremental inhalation health risk analysis was conducted as part of the SPGF Title V Permit Application ((PI 07349, Application No. BOP210002, July 2, 2021). The health risk analysis modeled toxic air pollutant (TAP) emissions resulting from the proposed SPGF Project, and evaluated the potential for possible increased cancer risks, increased chronic (long-term) non-cancer health hazards, and increased acute (short-term) non-cancer health hazards from inhalation of TAPs. The information below, references, methodology and supporting detail, are available in the Application at NJDEP's Enhanced Notification Website (https://www.state.nj.us/dep/aqpp/epn.htm). The analysis presented below is a preliminary, prepared by PVSC as part of the permit Application. It is being reviewed by the NJDEP for methodology and approach as part of the detailed permit technical review conducted by the air quality permitting program.

A. Risk Analysis Approach

1. Level 1 Risk Analysis

Health risk assessments are required for new or modified equipment with the potential to emit toxic air pollutants above the reporting thresholds listed in N.J.A.C. 7:27-17. A health risk assessment is required for the CTGs, because each CTG has maximum potential emission rates of formaldehyde and acrolein that exceed these thresholds. A health risk assessment is also required for the BSGs due to maximum potential emission rates of acrolein, formaldehyde and ethylene dibromide exceeding the reporting thresholds. For the fire pump engines, all of the maximum potential air emission rates would be below reporting thresholds. This means that the air emission rates are insignificant, and not required to be reported in the application or considered in a health risk assessment.

The Level 1 Risk analysis was completed using the NJDEP Risk Screening Worksheet for a single CTG. The analysis determined there was negligible[2] risk for acrolein. However, further evaluation (Level 2 Risk Analysis) was required for formaldehyde.

The Level 1 Risk Analysis was completed for a single BSG. The analysis determined there was negligible risk for ethylene dibromide. However, further evaluation (Level 2 Risk Analysis) was required for acrolein and formaldehyde.

2. Level 2 Risk Analysis

NJDEP policy provides that if a Level 1 risk analysis indicates a need for further review, a refined risk assessment must be conducted. Only those toxic air pollutants with a "further

[2] The word "negligible" is used in NJDEP regulations to describe certain levels of contaminant emissions, effects on surrounding air quality, or levels of risk assessment. While used as a statistical identifier and not as a value judgment, not-unfounded criticism has been voiced during SPGF meetings that the word can be viewed as offensive to affected communities. NJDEP may wish to consider revising this terminology.

evaluation is required" (FER) result are required to undergo a refined risk assessment. (NJDEP, 2010, Procedures to Conduct Risk Assessments to Determine the Incremental Health Risks from New or Modified Equipment; NJDEP, 2018, Technical Manual 1003: Guidance on Preparing a Risk Assessment Protocol for Air Contaminant Emissions; both available at https://www.state.nj.us/dep/aqpp/risk.html).

A Level 2 analysis for formaldehyde and acrolein emissions from the CTGs and BSGs was conducted using USEPA's AERMOD, a refined atmospheric dispersion model that predicts ambient air concentrations more accurately than the Level 1 Worksheet by using stack- and source-specific data as well as representative local meteorological data.

Typically, NJDEP conducts the refined dispersion modeling after the air permit application is submitted, unless the applicant specifies that they will conduct the analysis (Technical Manual 1003). PVSC chose to conduct this analysis early, as part of the permit application, to make incremental inhalation health risk information available to the community for the review of this application. NJDEP concurred with this approach. NJDEP required that PVSC conduct the modeling in accordance with Technical Manual 1002 and submit a draft modeling protocol and preliminary modeling results along with the permit application and risk screening spreadsheet.

B. Refined Dispersion Modeling and Risk Impacts

Cancer risks were determined by multiplying AERMOD-predicted exposure estimates for carcinogenic chemicals by the corresponding NJDEP-recommended Unit Risk Factor (URF). The URF is the estimated excess probability of contracting cancer as the result of continuous exposure over a 70-year lifetime to an ambient concentration of one microgram of a chemical per cubic meter of air (ug/m3). The methodology is conservative, as it assumes individuals would be exposed to the TAP for almost every hour of each day over 70 years.

Chronic and acute non-cancer health hazard estimates were calculated by dividing the AERMOD-predicted exposure estimates by NJDEP's Reference Concentrations (RfC). RfCs are estimates of the highest exposure levels that would not cause adverse chronic or acute health effects even if exposures continue over a lifetime. The ratio of exposure concentration to reference concentration is a Hazard Quotient (HQ). An HQ greater than one indicates the potential for adverse health effects, and a HQ less than one indicates that adverse health effects are unlikely.

The averaging periods, URF, RfC and risk thresholds for each TAP of concern are summarized in the table below. If all evaluated health risks fall into the negligible category, no further risk assessment is needed.

Pollutant	Averaging Period	URF	RfC	Significant Risk Level
Formaldehyde	Long-term (five-year or annual)	1.3×10^{-5}	9 ug/m3	IR > 1E-6 and $HQ_{lt} > 1$
Formaldehyde	Short-term (one hour)	-	55 ug/m3	$HQ_{st} > 1$
Acrolein	Short-term (one hour)	-	2.5 ug/m3	$HQ_{st} > 1$

IR=Incremental Cancer Risk; HQlt=Hazard Quotient Long-term; HQst = Hazard Quotient Short-term; URF = Unit Risk Factor

Note: 1) Reference concentrations and Unit Risk Factor obtained from NJDEP's toxicity values for inhalation exposure, updated June 2020.

C. Formaldehyde and Acrolein

Refined dispersion modeling was conducted with AERMOD for formaldehyde and acrolein emissions to evaluate combined overall risk impacts from simultaneous operation of the CTGs and BSGs together. A worst-case operating scenario was selected to calculate the combined overall risk impact from the SPGF project

Modeled maximum ground-level concentrations (over five years of meteorological data) were found to be below all NJDEP health risk criteria. The maximum ground-level concentrations would occur at the Facility fence line, adjacent to the proposed SPGF building.

Six sensitive receptor locations were selected for the analysis. The sensitive receptors modeled were the nearest residence in the Ironbound District, the nearest residential area across the Newark Bay, prisons in the vicinity of the PVSC's plant, and the New Jersey Transit building next to PVSC's plant.

Modeled ground-level concentrations at all of the sensitive receptor locations were found to be well below all NJDEP health risk criteria. The formaldehyde and acrolein concentrations from the proposed SPGF decrease significantly with distance from the PVSC facility.

D. Conclusion

NJDEP Technical Manual 1003 provides risk assessment guidelines for air permit applications to assist NJDEP in evaluating whether a proposed project could cause incremental inhalation health risks that are unacceptable. The Manual states that these procedures: do not consider the existing risk of cancer and other maladies associated with smoking, occupational or domestic exposures, dietary habits, inherited traits, or other factors that impact health and wellbeing; nor do they consider health risks from other nearby air toxics sources or existing levels of toxics in the ambient air.

The NJDEP's risk management guidelines for proposed new or modified source operations in air permit applications are summarized in the tables below as taken from the NJDEP, 2018 Technical Manual 1003:

NJDEP Inhalation Incremental Cancer Risk Guidelines for New or Modified Sources

Risk Level	**Outcome**
Risk <= 1 in a million (1 x 10-^{4})	Negligible Risk
1 in a million < Risk < 100 in a million	Case-by-Case review by NJDEP Risk Management Committee
Risk >= 100 in a million (1 x 10^{-4})	Unacceptable Risk

NJDEP Long- and Short-Term Non-Cancer Inhalation Risk Guidelines for New or Modified Sources

Risk Level	**Outcome**
Hazard Quotient <= 1	Negligible Risk
Hazard Quotient > 1	Case-by-Case review by NJDEP Risk Management Committee

If all evaluated health risks fall into the negligible category, no further risk assessment or change to the air permit is needed. If any of the evaluated health risks do not fall into the negligible category, the NJDEP Risk Management Committee Review would evaluate the impact and make appropriate recommendations for mitigation.

1. Formaldehyde

Long-term formaldehyde emissions from the proposed SPGF would not cause an incremental cancer risk greater than one in a million near the project location or at any of the sensitive receptor locations. The maximum modeled incremental cancer risk of 8.61 x 10^{-7} would occur at the Facility fence line on Doremus Avenue. Of all the sensitive receptors modeled, the maximum incremental cancer risk of 1.43 x 10^{-7} would occur for an employee at the New Jersey Transit building. These impacts are all below the 1-in-a-million threshold. The incremental cancer risk for Ironbound Community would be less than 4.29x 10^{-9}, which is well below the one-in-a-million threshold. The incremental long-term cancer health risk, therefore, would be considered negligible.

Formaldehyde emissions from the proposed SPGF would also not increase the long-term (chronic) HQ greater than one near the project location or at any of the sensitive receptor locations. The maximum chronic HQ of 0.008 would occur at the fence line on Doremus Avenue. Of all the sensitive receptors evaluated, the maximum chronic HQ risk impact of 0.00128 would occur for an employee at the NJ Transit building. These impacts would all be below the threshold of 1. The chronic HQ for Ironbound Community would be less than 3.67x 10^{-5} combined, which is well below the threshold of one. The long-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

Short-term peak formaldehyde emissions from the proposed SPGF would not increase the short-term (acute) HQ greater than one near the project location or at any of the sensitive receptor locations. The maximum acute HQ of 0.09 occurs at the fence line on Doremus Avenue. Of all the sensitive receptors evaluated, the maximum acute HQ risk impact of 0.043 is predicted to occur for an employee at the NJ Transit building. The short-term HQ for Ironbound Community is in the range of 0.016, which is well below the threshold of one. The short-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

2. Acrolein

Short-term peak acrolein emissions from the proposed SPGF would not increase the short-term (acute) HQ greater than one near the project location or at any of the sensitive receptor locations. The maximum acute HQ of 0.451 is modeled to occur at the fence line on Doremus Avenue. Of all the sensitive receptors selected, the maximum acute HQ risk impact of 0.208 would occur for an employee at the N.J. Transit building. These impacts are all below the threshold of one. The short-term HQ for Ironbound Community would be less than 0.012, which is well below the threshold of one. The short-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

VIII. REDUCTIONS TO PUBLIC HEALTH STRESSORS IN HOST COMMUNITY

PVSC's goal is to go beyond this requirement by minimizing air pollutant emissions from the Standby Power Generation Facility project AND to more than offset the remaining emissions with emissions reductions from other equipment at PVSC's facility. This would provide a net air quality benefit for our Newark neighborhoods, which are a designated overburdened community. PVSC is proposing voluntarily to undertake a direct engineering measure to minimize air pollutant emissions from the CTGs – the addition of selective catalytic reduction for NOx control, and the addition of oxidation catalysts (OC) for carbon monoxide (CO) and volatile organic compound (VOC) control.

As described in the Title V Significant Modification Air Permit Application (PI 07349, Application No. BOP210002, July 2, 2021, available at https://www.state.nj.us/dep/aqpp/epn.htm), maximum potential emission rates from all of the proposed SPGF equipment would be below NJDEP state-of-the-art (SOTA) applicability thresholds. If the CTGs were subject to SOTA, the required emissions control technology for these natural-gas-fired simple-cycle emergency/standby turbines would be to have Dry Low-NOx Combustors (DLN) for NOx control and an oxidation catalyst for CO control. With SCR, each CTG would emit approximately 1/3 of the NOx it would otherwise emit with DLN. Therefore, by voluntarily proposing SCR for NOx control, PVSC is reducing NOx emissions by 2/3 from what could be required. NOx is a precursor to ozone formation. Ozone (smog) likely is a public health stressor in the community, so this measure would reduce the project's contribution to a public health stressor.

PVSC is also proposing a direct operational measure to reduce potential air emissions from the SPGF. The SPGF would be operated only for emergencies, for utility demand response, for storm preparation, and for monthly maintenance/exercising. PVSC withdrew its January 13, 2021, Title V Significant Modification Application, which included operating the SPGF for non-emergency peak load management. PVSC re-submitted the Application without the peak load management operating scenario on July 2, 2021. This change resulted in a forty percent reduction in maximum potential SPGF operating hours and annual emission rates. The resulting maximum potential emission rates for the SPGF project are shown below in comparison with NJDEP's "significant" increase thresholds (N.J.A.C. 7:27-18.7).

SPGF Maximum Potential Emission Rates

Air Pollutant	Significant Net Emission Increase Threshold (tons/year)	SPGF Maximum Potential to Emit (tons/year)
Carbon Monoxide	100	4.4
Nitrogen Oxides	25	2.3

Particulate Matter < 10 Microns	15	2.9
Sulfur Dioxide	40	0.7
Volatile Organic Compounds	25	1.4

PVSC is committed to supporting Environmental Justice in the community and to supporting the 2050 New Jersey Energy Master Plan. PVSC understands that a goal of the rules being developed to implement the Environmental Justice Law (N.J.S.A. 13:1D-157, et seq.) is to avoid having a project of disproportionate impact to a health stressor in an overburdened community.

In 2020, PVSC's Commissioners charged staff to re-evaluate developing green and other technologies in order to make PVSC more energy efficient and to reduce air emissions from overall plant operations. The result of that process is PVSC's Energy Sustainability Roadmap, which PVSC unveiled at its most recent SPGF public outreach meeting on December 16, 2020. PVSC also summarized the Roadmap at its January 13, 2022, Public Commissioners Meeting. The Roadmap was developed with support from PVSC's Energy Consultant, Design Professionals and Program Management Team, as well as with input from the stakeholder community and energy consultants that have approached PVSC through the public outreach process. The Roadmap lays out a plan to make the Newark Bay Wastewater Treatment Plant more resilient to future events that could take the power grid offline, while at the same time fulfilling the requirements of New Jersey's landmark Environmental Justice Law and promoting the State's 2050 Energy Master Plan.

As previously stated, and in addition to direct feedback, PVSC met with a number of industry consultants as a result of the RFP Lite process initiated with stakeholders. The industry consultants presented a number of intriguing, innovative ideas for consideration, some of which PVSC had previously considered and some of which were new iterations on previously considered ideas. They included the following:

1. Utilization of mobile batteries stored on barges in Newark Bay and/or trucked on site as need. The barges and/or truck depots would be sized to allow for continuous operation by having a sufficient fleet of batteries available to be move to local power plants for charging while others were in operation. Concerns with this proposal are the barges are using local power plants for charging and may not be available during an event and not under direct control of PVSC. The barges represent a risk in the Bay during storm events and transporting the barges when the facility is truly needed is the most challenging.

2. The installation of PV solar panels throughout the facility, on neighboring properties and the use of the Newark Energy Center (NEC). These proposals had a limitation of

four to six hours of stored energy, which is not sufficient. Additionally, as noted below, NEC is not an available source of power based on direct discussions with them.

3. Alternative Fuels – This proposal suggested using onsite storage of alternative fuel sources, such as methanol, hydrogen, or biogas to power the CTGs turbines. The limitation of this proposal is that the proposed storage would only allow for up to four hours of stored energy.

4. Newark Energy Center. There are a number of issues that prevent NEC from being used as an emergency power source for PVSC. One of the main issues is that NEC is a private, for-profit entity whose obligations are to its shareholders, not to the public. An agreement would need to be reached pursuant to which NEC would guarantee a power supply even when business reasons dictate that the plant should not be in operation. Also, the NEC plant does not have black start capabilities and will not be available during a loss of power event. Further, PVSC has no control over NEC's operations should NEC decide during an emergent event, such as a hurricane, that it cannot safely maintain operations. Equally important, using NEC still produces significant emissions; at a minimum, there would be no offset in emissions such as there will be under PVSC's plan. Finally, NEC is a natural gas-fired plant. Accordingly, using NEC as a backup power source provides no reduction in PVSC's dependence on fossil fuels, such as there will be under PVSC's plan.

While none of the proposals were deemed sufficient to represent a full replacement for the SPGF, each has provided ideas that can supplement the SPGF and help achieve the goal of reducing Greenhouse Gas emissions and meeting the New Jersey Energy Master Plan.

It is with this in mind that PVSC created its Energy Sustainability Roadmap. The Roadmap contains three milestones on the path to achieving facility resiliency, air emissions reductions, and compliance with the 2050 Energy Master Plan. Milestone One (2022-2025) involves adding batteries and solar panels at the facility, removing older fossil-fuel combustion sources (boilers and stationary engines), and conducting studies with the goal of ultimately transitioning the fuel source for SPGF from natural gas to an alternative renewable fuel source, such as green hydrogen, methanol, and/or other advanced fuel sources. PVSC will commence the transition as soon as the turbine manufacturer can modify the turbines to do so. As a result, PVSC will be able in relatively short order to reduce air stressors such as nitrogen oxides, carbon monoxide, volatile organic compounds, and greenhouse gasses, and provide improvement to overall air quality for the local community. When these improvements are completed, the air will be cleaner than it is today.

A. Milestone 1 – 2022-2025

PVSC has set the identified a list of projects in the table below, which can be accomplished during the first milestone years of 2022-2025.

Action	Benefit
Complete SPGF as part of a hybrid microgrid to meet FEMA/NJDEP resiliency requirements while maintaining uninterrupted, sustained operations of the WWTP during emergency events.	Supports NJ EMP *Strategy 3: Maximizing Energy Efficiency and Conservation, and Reducing Demand*. The SPGF's GHG and air pollutant emission rates would be lower than those from the PSE&G regional utility grid for peak standby power production. PVSC's removing its equipment from the electrical grid and providing its own power would provide a regional net air quality benefit during demand response periods when the reliability of the grid is threatened (e.g., a hot summer day)
Continue dialogue with CTG manufacturer to convert to use of Green Advanced Renewable Fuels as the market becomes available. (Calculations below based on use of up to 5% Hydrogen)	Supports NJ EMP *Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources*. Would reduce GHG emissions from CTGs. Innovative on-site generation of renewable alternative fuels from PVSC waste streams coupled with solar power also supports NJ EMP *Strategy 7: Expand the Clean Energy Innovation Economy.*
Add Advanced Emission Controls to existing plant equipment where applicable	Supports Environmental Justice Law. Would provide direct actual air pollutant emissions reductions.
Complete design and begin construction of Oxygen Production Facility upgrades to include elimination of the existing boilers. This will reduce overall energy consumption.	Supports Environmental Justice Law. Would provide direct actual air pollutant emissions reductions.
Install eight MW of solar panels on PVSC site. Additional solar will be considered depending on site availability	Supports NJ EMP *Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources*. Would reduce PVSC's annual demand from the utility grid.
Install five MW/10 MWh modular batteries. Would provide two hours of backup power.	Supports NJ EMP *Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources*. Through peak load management, would reduce PVSC's electric utility demand when grid is most polluting.
De-commission and remove the 600-kW Headend emergency standby diesel engine generator, the Operations & Maintenance Building Boilers, the Oxygen Production Boilers, and the Grit & Screening Boilers.	Supports Environmental Justice Law. Would provide direct actual air pollutant emissions reductions to offset SPGF. Would reduce PVSC's GHG emissions.

In October 2021, PVSC submitted a TREC application to the New Jersey Board of Public Utilities to install solar panels covering available space at PVSC's plant. While not enough to provide the backup power needed, the solar energy could offset a portion of the daily energy usage during normal operations, reducing PVSC's carbon footprint.

PVSC has engaged three outside energy consultants to assist in the study of overall plant operations to identify potential for the creation of on-site green advanced renewable fuels. This includes investigating the development of green hydrogen from the solar panels as well as from waste streams at the plant.

PVSC will partner with industry leaders and academic institutions to explore and implement these cutting-edge technologies. These fuels would be used to run the standby power generating facility as well as other existing equipment at the facility, further reducing environmental health stressors and greenhouse gases. Specifically, these consultants will be exploring the following:

- Investigate WWTP processes for potential to create clean, net-zero carbon fuels that can be stored on-site and used to fuel the SPGF.
- Preparation of Solar TREC application and quarterly reports. Investigate creating on-site hydrogen or methane sources to power the SPGF through Green Advanced Renewable Fuels.
- Investigate WWTP processes for potential to create clean, net-zero carbon fuels that can be stored on-site and used to fuel the SPGF.

The Roadmap also includes the following additional actions in Milestone 1:

- Continue to investigate options to accelerate plan to modify SPGF turbines to achieve 100% capability of use of green advanced renewable fuels
- Install fuel management upgrades to existing boilers and advanced emissions controls
- Investigate feasibility to co-fire existing boilers with renewable fuel sources
- Continue development of biosolids management master plan with emphasis on clean technology
- Continue to develop Energy Sustainability Roadmap and evaluate advanced renewable fuels
- Investigate decommissioning all diesel fire pumps throughout the facility
- Continue to collaborate with stakeholders

B. Milestone 2 – 2025-2030

By 2030, PVSC is committed to further reducing GHG emissions to support the New Jersey's 2030 GHG Goals and the following actions will assist in meeting this commitment.

Action	Benefit
Invest in the production and storage of Green Advanced Renewable fuels and leverage renewable energy technologies as they advance in order to achieve the NJ Energy Master Plan goal of 100% clean energy by 2050.	Supports NJ EMP *Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources*. Would reduce GHG emissions from CTGs. Innovative on-site generation of alternative fuel from PVSC waste streams from solar power also supports NJ EMP *Strategy 7: Expand the Clean Energy Innovation Economy.*
As the technology becomes available, convert SPGF combustion turbine generators to 100% use of Green Advanced Renewable Fuels.	Supports NJ EMP *Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources*. Would reduce GHG emissions from CTGs. Innovative on-site generation of hydrogen from solar power also supports NJ EMP *Strategy 7: Expand the Clean Energy Innovation Economy.*
Implement initiatives identified by renewable energy consultants hired by PVSC.	TBD

C. Milestone 3 – 2030-2050

Finally, Milestone 3 (2030-2050) includes PVSC's commitment to continuing to work with the State to implement advanced technologies consistent with the 2050 Energy Master Plan as those technologies becomes available, which we expect they will.

IX. OVERALL IMPACTS TO FACILITY-WIDE EMISSIONS

PVSC's plans for the SPGF and the overall operations at WWTP are expected to lead to net reductions in emissions by 2025. The table below shows the emissions from the SPGF, offset by the actions outlined in Milestone 1 for the period 2022-2025. For the SPGF, the projected actual emissions are based on the restricted hours of operations, projected at 1,284 hours, as described above. By operating at more restrictive hours and utilizing state-of-the-art equipment, the projected actual emissions are significantly below the maximum potential emissions that are included in the permit application.

The projects in Milestone 1 that will lower emissions include the removal and replacement of existing boilers and the installation of Selective Catalytic Reduction and oxidization catalysts to the Zimpro boilers. These critical investments will lower net on-site emissions and net greenhouse gas emissions from the daily operations and improve air quality. They will also offset the emissions from the 12 days a year that the SPGF is operating. The planned battery storage and solar projects under Milestone 1 will also lead to significant reductions in greenhouse gas emissions by replacing or offsetting fossil fuel-generated electricity. The combination of the emissions reductions on-site and through the renewables projects can reduce greenhouse gas emissions by 9,000 tons annually. With the actions noted in Milestone 1 above, the following calculated reduction could be achieved related to net on-site emission rates and the total net GHG emissions. These reductions are calculated with the SPGF in operation. The SPGF emission rates shown are based on its future estimated actual operation (not its maximum potential to emit). The negative emission rates shown for equipment to be removed or controlled are actual emission rates reported in emission statements for the facility.

PVSC Standby Power Generation Facility (SPGF)

Quantification of PVSC Emission Reduction Benefits (tons/year)

No.	Action	NOx	CO	PM-10	VOC	SO2	GHG CO2e
On-Site Direct Emissions							
Project	SPGF - future estimated actual	0.35	2.47	0.27	0.26	0.06	2485.00
1	Remove O&M Building Boilers	-0.89	-1.01	-0.19	-0.11	-0.02	-2965.00
2	Remove 600-kW Engine Generator	-0.03	-0.02	0.00	-0.01	0.00	-3.30
3	Remove 2 Oxygen Production Boilers	-0.16	-0.14	-0.02	-0.01	0.00	-185.00
4	Remove 2 Grit and Screening Boilers	-0.17	-0.14	-0.02	0.00	0.00	-210.00
5	Add SCR and OC to Zimpro Boilers	-10.30	-3.42	0.00	-1.17	0.00	0.00
6	5% H2 in CTG Fuel	0.00	-0.12	-0.01	-0.01	0.00	-1183.43
Total Emissions Reductions		-11.54	-4.83	-0.23	-1.30	-0.02	-4546.73
Total Net On-Site Emission Rates		**-11.2**	**-2.4**	**0.0**	**-1.0**	**0.0**	**-2,062**
Off-Site Displaced Emissions from Utility Grid							**GHG**
Project	SPGF - Lower Carbon Intensity than Peaking Plants						-356
7	8 MW Solar Panels on PVSC Site						-6,213
8	5 MW / 10 MWh Modular Batteries for Peak Load Management						-371
Total Emissions Reductions							-6,940
Total Net On-Site and Off-Site GHG Emission Rates							**-9,001**

The estimated actual reductions above are future planned projects, not included in the current SPGF air permit application, but expected to be implemented by 2025. They represent just the beginning of PVSC's commitment to reducing overall environmental health stressors. The studies being completed by PVSC as noted in Milestone 1 are expected to produce recommendations for improvements to be completed in Milestone 2 that would lead to further reductions. PVSC is committed to the transition of the fuel source for the SPGF from natural gas to an alternative renewable fuel source or, more likely, a combination of alternative renewable fuel sources, as soon as the technology is available, providing further reductions in environmental health stressors.

X. BENEFITS TO HOST COMMUNITY

PVSC's WWTP is the single most important piece of public health infrastructure in the State of New Jersey.

- Inadequate wastewater treatment poses a threat to drinking water supplies and indoor plumbing.

- Worldwide, 80% of infectious diseases may be water-related and diarrheal diseases have been traced to contaminated water (American Academy of Microbiology).

- Among other environmental hazards, the lack of wastewater treatment impacts receiving waters, causing algae blooms, danger to floral and aquatic life, and danger to humans that consume fish.

Hurricane Sandy exposed a vulnerability that must be addressed to protect the community's public health and environment. The loss of power at the WWTP caused significant environmental, property and economic damage to the region. Complex computer modeling demonstrates that should PVSC lose power again for a significant period of time, and a wet weather event occurs during that period of time, the results will be unacceptable and catastrophic. These results include the back up of raw sewage into residential and commercial structures in Newark, Jersey City, and Bayonne, with street-level flooding in those same areas. Beyond the displacement of people from their homes and the destruction of their property, these people will be at risk of exposure to toxins, contaminants, and diseases in that raw sewage.

In addition, there is the damage caused to the environment by the discharge of raw sewage into Newark Bay and other nearby bodies of water. There is also the threat to the supply of drinking water for the region, in which PVSC plays a critical, essential role. Finally, there is the economic damage caused to the surrounding communities, which was estimated to be $4.1 billion as a result of Hurricane Sandy.

A reliable power source is an integral part of the resiliency of the WWTP and critical to maintain operations and public health. If power is lost at the WWTP for 72 hours, as was the case during Hurricane Sandy, and there is a significant rain event, there will be backups in the collection system resulting in basement and street level flooding. Figure 10-1 below represents the flooding that is expected to occur in the Newark/Jersey City/Bayonne areas during a typical 100-year rain event coupled with a power loss at the WWTP for 72 hours.

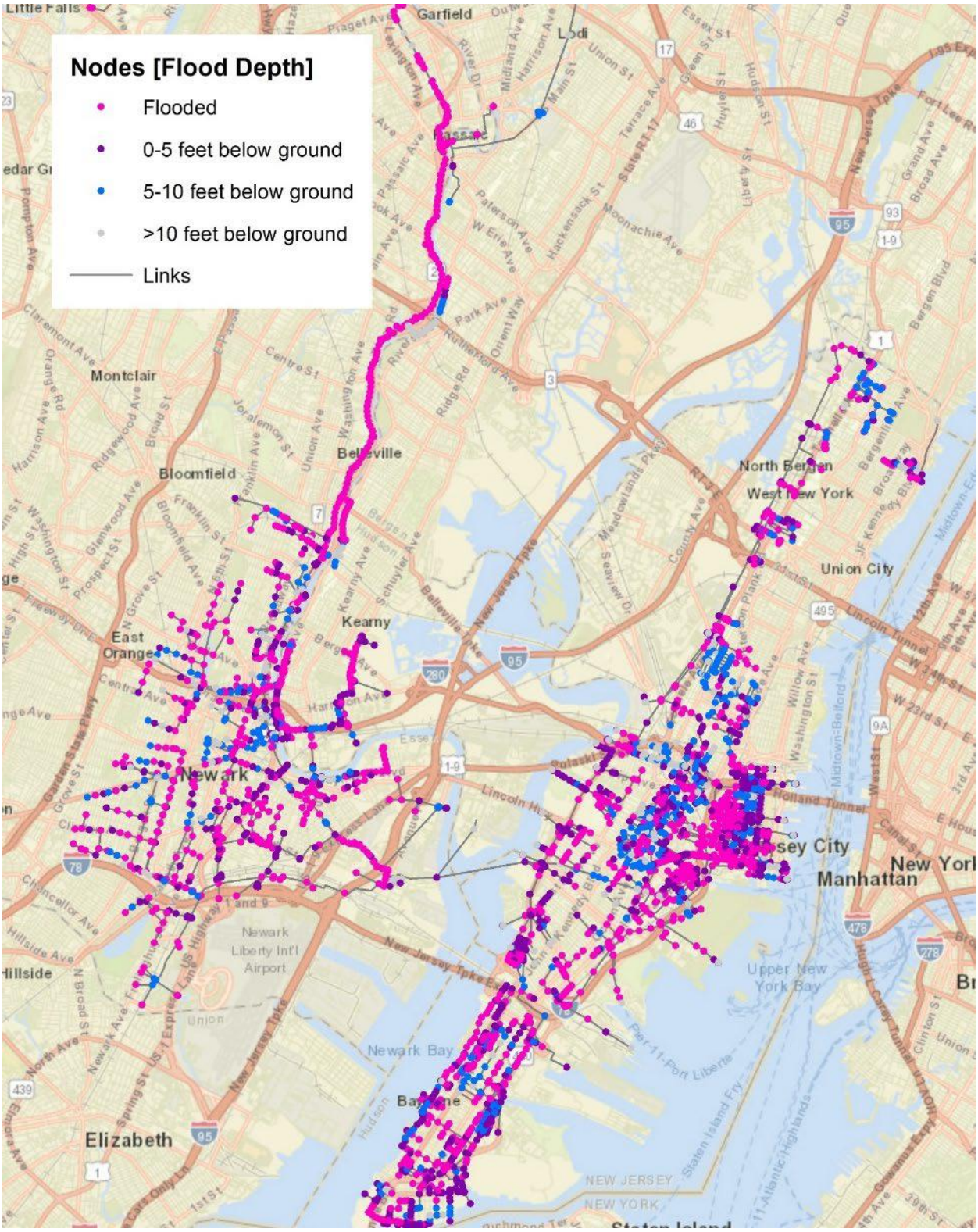
Nodes [Flood Depth]
Flooded
0-5 feet below ground
5-10 feet below ground
>10 feet below ground
Links
Little Falls
Garfield
Lodi
Montclair
Bloomfield
Belleville
Kearny
East Orange
Newark
Newark Liberty Int'l Airport
Elizabeth
North Bergen
West New York
Union City
Manhattan
Upper New York Bay
Newark Bay
NEW JERSEY
NEW YORK

Figure 10-1.

On September 1, 2021, PVSC recorded a historically-high plant influent flow during Hurricane Ida. On that date, the plant influent flow jumped from 274 million gallons per day to 798 million gallons per day within the short time span of three hours, 11 minutes (3:11). Figure 10-2 represents the increased street-level flooding that would occur in the event PVSC loses power for 72 hours during a storm of the equivalent intensity of Hurricane Ida.

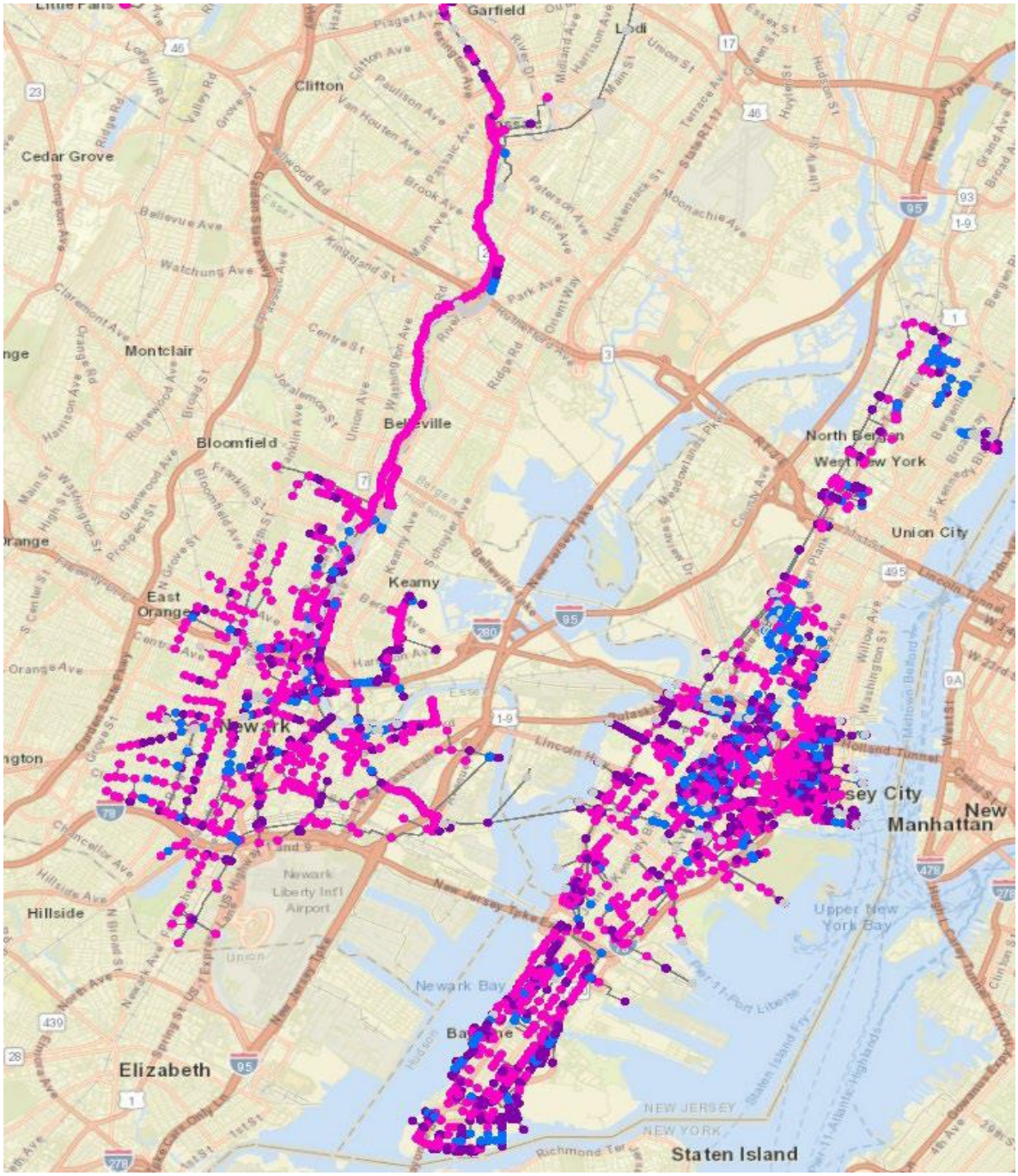

Figure 10-2.

Based on complex computer modeling, Figure 10-3 shows what street-level flooding in the Ironbound section of Newark at the intersection of Polk Street and Clover Street would look like in the event of a power loss at PVSC coupled with rainfall from a typical 100-year storm:

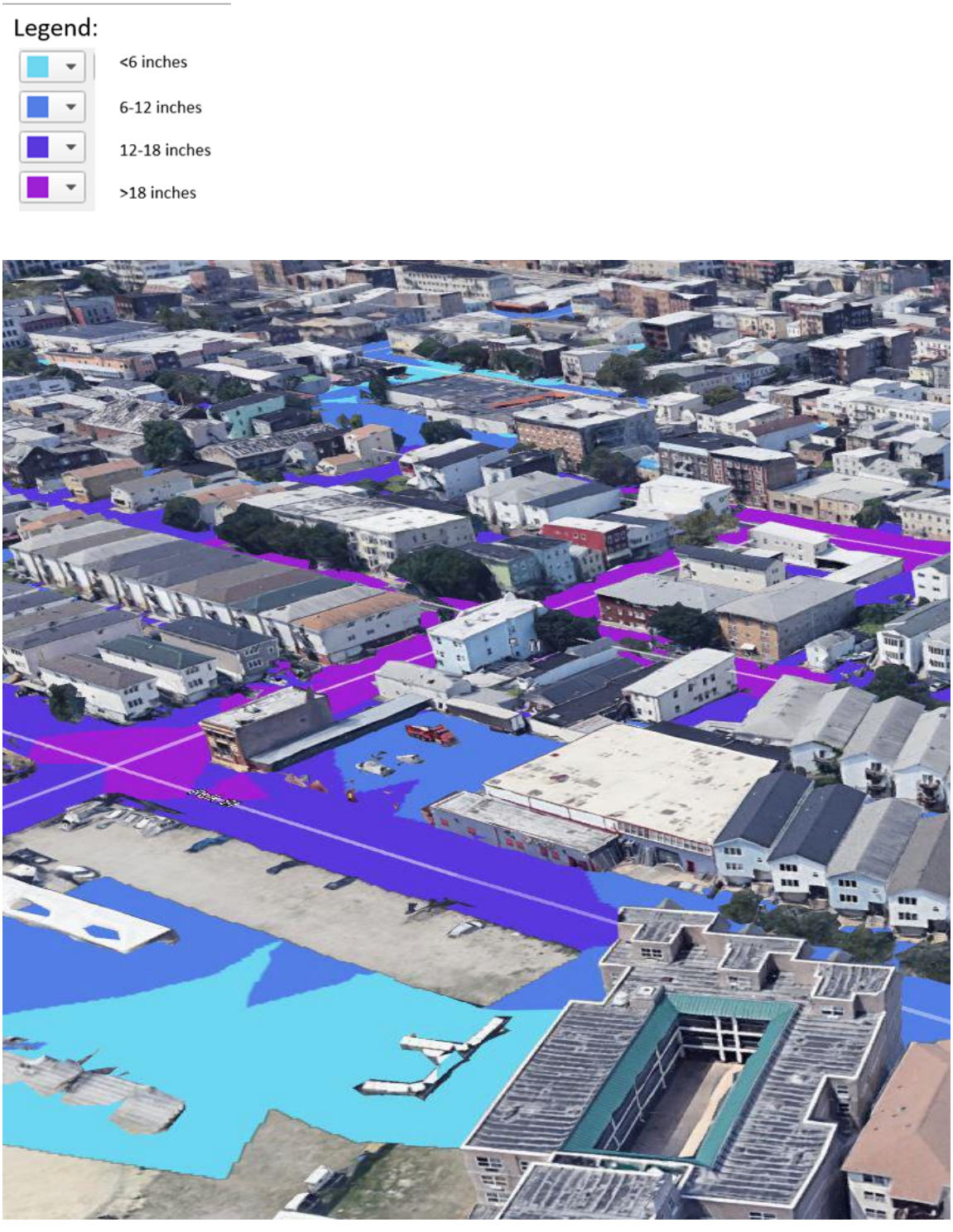

Figure 10-3.

Similarly, Figure 10-4 shows what street-level flooding in the Ironbound section of Newark at the intersection of Polk Street and Clover Street would look like in the event of a power loss at PVSC coupled with rainfall from as storm equivalent to Hurricane Ida:

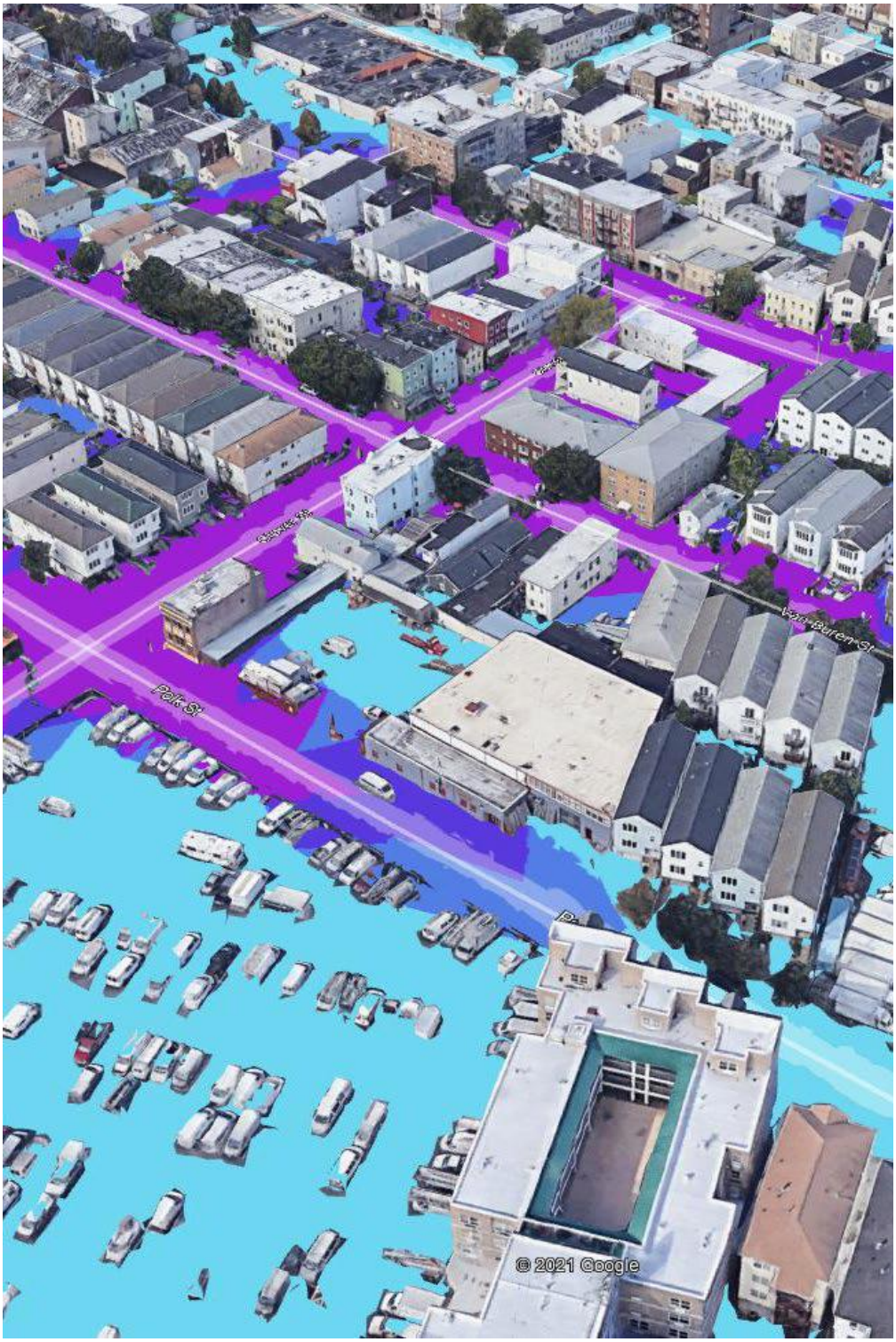

Figure 10-4.

This is why PVSC must have a reliable power source to prevent damages from future events. The power source needs to be a power supply independent from other suppliers and resilient from any threat that could take the power supply down.

In summary, PVSC's Energy Resiliency Roadmap provides a plan that will reduce environmental health stressors with the SPGF in operations and sets forth a plan to further improve upon this plan as technology evolves.

- A reliable power source will allow for the continued operation of the wastewater treatment plant, protecting public health throughout the region.
- Environmental health stressors such as nitrogen oxides, carbon monoxide and volatile organic compounds will be reduced, providing a direct benefit to our neighbors.
- Greenhouse gases will be reduced, providing an overall benefit to the environment.
- PVSC commits to continuing to identify additional improvements that can assist in further reducing health stressors and greenhouse gases.